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**The Management of Ocean and Coastal Resources
in Colombia: An Assessment**

by

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ABSTRACT

This report summarizes the results of an 18-month study of coastal and marine resources development in Colombia. The study was a result of a request by the Dirección General Marítima y Portuaria (DIMAR) of the Colombian Navy to the Marine Policy and Ocean Management Center of WHOI and was carried out jointly with that group. Observations of the present situation and potential for four sectors are presented--fisheries and aquaculture, marine minerals and energy, marine transportation and ports, and tourism and coastal development. The coastal tourism and fisheries sectors appear to be the most promising in terms of near-term potential. Suggestions for achieving increased economic and social benefits from these sectors are provided. In addition, institutional arrangements among the ocean-related agencies in Colombia are reviewed and recommendations aimed at achieving a higher degree of policy integration are offered.

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FOREWORD

It is a pleasure to forward to the Dirección Marítima y Portuaria (DIMAR) of the Armada Nacional in Colombia this report assessing the management of ocean and coastal resources in Colombia. This study is the product of a collaborative effort between the Marine Policy and Ocean Management Center (MPOM) at the Woods Hole Oceanographic Institution (WHOI) and DIMAR, made possible through the generous support of the William H. Donner Foundation of New York City, DIMAR, the Pew Memorial Trust, and NOAA, National Sea Grant College Program, Department of Commerce, under Grant Nos. NA80-AA-D-00077 (E/L-1) and NA83-AA-D-00049 (E/L-1).

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On the WHOI side, many thanks are due to Robert W. Knecht, MPOM Senior Fellow, who organized and coordinated the work on this project. Robert W. Knecht, Biliana Cicin-Sain, James M. Broadus, and Maynard E. Silva were responsible for organizing and collecting the in-country field data. The work of the following scholars in researching and writing different sections of the report is gratefully acknowledged: Robert E. Bowen, James M. Broadus, Biliana Cicin-Sain, Robert W. Knecht, Henry S. Marcus, Susan B. Peterson, and Maynard E. Silva. Other contributors to the project include Paul M. Fye, President of the WHOI Corporation, and Ivon d'Almeida Pires Filho, International Fellow. Finally, we gratefully acknowledge the work of Ingrid Desilvestre, MPOM Research Assistant, for her multiple and varied efforts on behalf of the project.

Organization of the report: Although the overall study represents an MPOM team effort, individual authors are responsible for the interpretations contained in their respective chapters, as follows: CHAPTER 1, INTRODUCTION: COLOMBIA AND THE CHALLENGE OF MANAGING COASTAL AND OCEAN RESOURCES, by Biliana Cicin-Sain; CHAPTER 2, FISHERIES AND AQUACULTURE, by Maynard E. Silva and Susan B. Peterson; CHAPTER 3, OCEAN ENERGY AND MINERALS, by James M. Broadus; CHAPTER 4, A DIAGNOSIS OF COLOMBIAN MARITIME ACTIVITIES, by Robert E. Bowen and Henry S. Marcus; CHAPTER 5, TOURISM AND COASTAL DEVELOPMENT, by Robert W. Knecht; and CHAPTER 6, INSTITUTIONAL CONSIDERATIONS, by Biliana Cicin-Sain and

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EXECUTIVE SUMMARY

1. INTRODUCTION

Traditionally, Colombia has been a nation oriented toward the interior of the country. With the majority of the population well removed from the sea, with the mainstay of the Colombian economy based on land resources, and with many of the larger cities located in the high Andean valleys, it is understandable that the oceans have not been a major force in the development of the nation. But can they? Is it likely that marine resources or uses, if further developed, could play a significant role in Colombia's future? And, how should Colombia's present marine effort be organized to increase the chances that ocean-related opportunities are examined in a timely manner and effectively incorporated into Colombia's overall economic development effort? It is with these two major questions that the current study is concerned.

As in most Latin American nations, planning for the development of coastal and marine resources in Colombia is at an embryonic stage. However, it is our impression that the current situation in the country exhibits a variety of ingredients necessary to launch an accelerated ocean development effort:

1) Ocean and coastal areas under Colombian jurisdiction are indeed extensive. With the establishment of the Exclusive Economic Zone in 1978, Colombia assumed jurisdiction over a marine area equalling 87% of the continental area of the country. Few nations in the world have such extensive coastlines on two different seas, with the potential development of different types of resources that such ocean access may ultimately entail.

2) Groundwork has been laid in recent years to develop the Colombian coasts and oceans. A National Plan for the Development of Marine Science was developed in 1980 by the Departamento Nacional de Planeación (DNP, the national planning office) and other Colombian agencies with advice from UNESCO and the United Nations Development Programme. This document set forth a plan for development of marine science and technology, and for obtaining the necessary knowledge on Colombia's marine resources. Although the marine sciences plan has not yet been fully implemented, significant strides have been made in meeting its goals, thus providing the base for the second and

present stage in planning--how can these marine resources best be managed for the long-term socioeconomic benefit of the Colombian people?

3) A readiness appears to exist on the part of current government representatives to develop ocean resources: President Belisario Betancur has exhibited a very tangible interest in ocean affairs; the Navy's Office of Ports and Merchant Marine (DIMAR) has been a leader in proposing and sustaining the effort necessary to put into place new ocean policy initiatives; the Comisión Colombiana de Oceanografía (CCO) has been restructured to achieve more effective organization; and, a new source of funding for ocean research projects, FONDEMAR, has been established to promote the needed collection of ocean resources data.

4) Colombia has a cadre of capable marine activists and thinkers, who are making important contributions to conceptual development in ocean management, nationally and internationally, operating in such entities as DIMAR (particularly in its CIOH unit), COLCIENCIAS, CCO.

5) Colombia is at a pivotal point in the ocean planning process. It is still at an early stage in ocean development, and it has the opportunity and the leadership available to study how other nations have approached the development of ocean resources. Through such analytical efforts, it may avoid the mistakes made by others and profit by examples of success.

Given a situation of limited resources and keen competition from nonmarine sectors, the next few steps in ocean development will need to be chosen very carefully, for ocean activities will need to "prove" themselves to gain overall stature and recognition--which will then work in turn to attract more interest and investment.

The present report summarizes an 18-month study of coastal and marine resources management in Colombia, the product of a collaborative effort between DIMAR and the Marine Policy and Ocean Management Center (MPOM) of the Woods Hole Oceanographic Institution (WHOI). In late 1981, MPOM/WHOI received a grant from the William H. Donner Foundation of New York City to study techniques for assisting developing nations in the formulation and application of marine resources development policy. Shortly after an April 1982 workshop

had been held in Woods Hole to discuss the new program, the Director of DIMAR contacted WHOI to express an interest in the program; Colombia was the first nation to do so.

Further discussion led to an exploratory trip to Colombia in June 1982 by David A. Ross (MPOM Director) and Robert W. Knecht (MPOM Senior Fellow), followed in September 1982 by a delegation from MPOM/WHOI that spent a week in Bogotá working on a "framework agreement" for a cooperative program involving DIMAR and MPOM/WHOI. Commander Rafael Steer Ruiz, Director of DIMAR's Centro de Investigaciones Oceanográficas e Hidrográficas (CIOH), was designated as the official Colombian counterpart to the project and as leader of the Colombian effort. This agreement described the cooperative program and set out the roles and responsibilities of the two institutions with a three-step plan: Phase I) DIMAR principally responsible for description of the actual situation in coastal and marine resources management; Phase II) MPOM/WHOI responsible for diagnosis of the situation; and Phase III) DIMAR responsible for formulation of a national master plan for marine and coastal resources development.

Field Activities: 1) A team from WHOI in May 1983, with the active support of DIMAR, conducted a series of interviews in Bogotá, Cartagena, Santa Marta and Barranquilla with over 30 representatives from ocean and coastal agencies and groups, seeking information on agency missions with respect to resources, funds and staff available for the ocean effort, plans under consideration, perceived problems, etc.

2) A workshop on Marine Resources Development, organized and funded by DIMAR, was held in Sasaima, Colombia in June 1983, which brought together representatives from most ocean-related organizations in Colombia, both public and private, to discuss current ocean and coastal related programs, as well as problems and opportunities in the development of different marine sectors. Recommendations from the report of the Sasaima meeting, prepared by DIMAR and based on interagency discussions at that meeting, played an important role in the formulation of the present report.

3) In September 1983, a DIMAR team, headed by Director Commander Rafael Steer Ruiz, travelled to Woods Hole for discussions and field trips aimed at

elucidating the U.S. approach to various types of marine resources management as well as for more focused work on the Colombian marine situation.

Between November 1983 and March 1984, sections of this report were made available in draft form for comment by the DIMAR team. Leon Bolaños, a DIMAR staff member, travelled to Woods Hole to assist in the preparation of the final report, which was completed in May 1984.

Summaries of the individual chapters of the report are provided below, followed by the full report of project results.

2. FISHERIES AND AQUACULTURE

Fisheries: Colombia's fishery resources on both the Atlantic and Pacific Oceans are currently exploited for domestic consumption and for foreign markets. Yet, the country presently imports more fisheries products than it exports. Sporadic stock assessments of the last decade suggest that the fishery resources exist for the expansion of Colombian fishery production (including shrimp, tuna, and herring). These untapped resources could be substituted for some of the products now imported (fish meal, canned fish [tuna and sardines], and fish oil). Expansion will require the integrated efforts of both industrial and artisanal fishermen, systematic and ongoing stock assessment efforts, coordination between agencies, development of markets, better investment environment, and attention to the fisheries trade problems created by the Andean Pact. With the competent fisheries personnel that Colombia possesses, the national fisheries development efforts should be successful.

There is sufficient governmental structure for fisheries development in Colombia, yet the large number of agencies (43) that theoretically play a role in fisheries development may hamper efficiency in the formulation and implementation of fisheries policy. An improved system of intragovernmental communication on fisheries matters might be considered. The Comisión Nacional de Pesca (CONALPES) could be the major vehicle to keep all those interested in and responsible for fisheries abreast of government projects, progress, problems, and plans. CONALPES, by including artisanal fishermen, seems to be

reducing their sense of isolation and neglect, thus improving the likelihood of overall success for fishery development efforts.

General goals, announced for Colombian maritime fisheries, include diversification of fisheries, creation of employment opportunities, enhancement of national nutrition, improvement in the fisheries balance of payments, distribution of development efforts, and the rational management of fisheries resources. These goals, although stated, have not resulted in clearly established targets.

The main fishery agency, Instituto de Desarrollo de los Recursos Naturales Renovables y del Ambiente (INDERENA), is now pursuing a policy whereby chosen fisheries will be developed by separate strategies, some designed to generate foreign exchange credits, others to supply the domestic market; but this mixed strategy could have distributional effects that run counter to the asserted goals of equitable fisheries development. Fisheries development plans also seem to be prepared in isolation, with no consideration given to the interface of artisanal fishermen with industrial fishermen. To achieve maximum return from fisheries resources, management of the various segments should be integrated. The focus for fisheries initiatives is presently on industrial fisheries, where the current strategy relies on joint ventures that can be profitable for all concerned, but that must be structured to benefit mutually both the partner and the host country.

To encourage fishery development, more public sector funds must be allocated for additional management personnel and research (e.g., regular stock assessments, product acceptability, marketing strategies). The major obstacle for development may be the availability of significant financial resources for investment in the private sector. The government should consider establishing guarantees or incentives to lure private investors to the industry. It could also be instrumental in fostering a better atmosphere for investment by changing the rules for allowable collateral that now deter some investors.

The stock assessments of the last decade may not be good indicators of the potential of fisheries development since the limited number of assessments makes accuracy and dependability difficult to judge. Each of the assessments

has occurred at a single point in time and might, therefore, reflect peaks or valleys in the natural fluctuations of fish stocks. Some of the Colombian fisheries, suitable for expansion according to existing data, are either unexploited or underexploited, yet the projected sustainable yields may not be as high as predicted. A large percentage of the fish harvested in Colombia is for domestic consumption, particularly the harvest by artisanal fishermen. Expansion and development of the fishing sector will therefore necessitate the creation of larger domestic markets.

Enforcement activities for fishing regulations are presently the responsibility of DIMAR and yet INDERENA promulgates those regulations. Thus, effective enforcement of fisheries regulations requires cooperation between the two agencies so that each may fulfill its responsibilities.

Aquaculture: Since Colombian maritime aquaculture is in its infancy, it is presently treated as a research area. While aquaculture may improve the nutritional well-being of the population, increase local income levels, improve standards of living, and increase the volume and value of exportable products, it may also compete with other production systems in the economy for labor, space, capital equipment, and financing. The benefits of aquaculture may be more widespread than as simply a source of food. Some indirect benefits may include the development of trained labor, improved markets for fresh fish and other products, and development of new roads or communication lines spurred by improved marketing and distribution of aquaculture products. Clearly, given its possible benefits as seen in Ecuador and Peru, aquaculture deserves continued study and assessment.

3. OCEAN ENERGY AND MINERALS

In general, little is known about Colombia's marine mineral and energy endowment. The current contribution of the marine minerals sector is negligible, with only some offshore gas and marine salt currently in production. Except for offshore oil and gas, and to a lesser extent marine salt resources, the potential contribution of most marine minerals to Colombia's economy is at this time remote and largely speculative. The long-term prospects for oil and gas offshore Colombia, however, are widely

regarded as good. In this context, the government's approach of continued study and measured investigation seems appropriate.

More remote possibilities for expanded minerals production in Colombia's marine jurisdiction might include iron sands, phosphates, sulfur, sand and gravel, gold, and salt, all of which have been offshore exploration and development targets in other parts of the world. With the possible exceptions of gold and salt, it appears that abundant onshore resources and the high cost of offshore exploration for and exploitation of these materials will remove to the distant future any possibility of significant new economic contributions from marine sources in Colombia. Marine salt would seem to warrant the continued attention of those interested in Colombia's marine resources potential.

The economic prospects of deepsea minerals, such as manganese nodules or polymetallic sulfides, are extremely doubtful. In this situation, substantial commitments to the speculative development of coastal processing facilities and related infrastructure in Colombia, as has been suggested by ECOMINAS, may well be premature and potentially wasteful. The economic promise of marine polymetallic sulfides is even more limited. Although Colombia appears to possess the oceanographic characteristics suitable for development of ocean thermal energy conversion (OTEC), the role of OTEC as a competitive energy source in Colombia must also be seen as remote.

Disruptive conflict between agencies having interests in the area of offshore minerals has been experienced by other nations. This does not now seem a serious problem in Colombia, but the potential for wasted effort and costly confusion through interagency rivalry is one that might warrant specific attention in the formulation of a marine resources master plan.

The scope and overview associated with a long-range planning exercise would also seem to provide an ideal context within which to address the issue of legal and regulatory rules, procedures, and jurisdictions in offshore minerals development. There may well be good reason for a separate legal regulatory structure for offshore minerals and energy, but exactly how onshore and offshore risks and rewards might differ, and the implication for appropriate legal-administrative designs are topics warranting further study.

Too much legal structure too soon can be expensive and even harmful, by prematurely imposing rules and regulations that turn out to be inappropriate to the mix and types of activities which eventually prove to be most productive. Resolution of international jurisdictional disputes over potential resources in marine areas would probably enhance the prospects for timely marine minerals and energy development.

To avoid planning or policy distortions, it is useful to examine the nature of likely interactions between marine minerals and energy and the other "subsectors" within Colombia's overall marine sector. Potential positive interactions include complementarities in infrastructure development, information acquisition, creation of new demand for the output of other subsectors, technological spinoffs, and opportunities for shared support services. Possible negative effects are use conflicts and interference, environmental risk, and the creation of interagency conflict within the government. Those activities showing the greatest potential of being harmed by marine minerals and energy efforts are tourism and fisheries. The marine subsector with the strongest apparent positive relationship to marine minerals and energy is marine science. Major positive interactions are also indicated for ports and harbors and marine transportation.

Basic cost-effective survey and study would seem to be all that is required at this time to pursue the longer-term prospects for offshore minerals. Cost-effective study can often be accomplished through the careful reworking and reinterpretation of existing data. Interagency coordination and cooperation can also reduce the likelihood of duplication and can permit data collected for one purpose, such as offshore oil and gas prospecting, to be used for other studies, such as basic marine minerals geology. Similarly, cost-effectiveness in research can be increased through international interaction and cooperation. Colombia is fortunate to have a core of well-qualified experts working in the marine minerals area, but even these individuals could benefit from increased contact with foreign colleagues and expanded opportunities for specialized training and experience.

4. A DIAGNOSIS OF COLOMBIAN MARITIME ACTIVITIES:

MARINE TRANSPORTATION AND PORTS

The Colombian Shipping Sector: The cost of marine transportation has until recently been a relatively neglected area with regard to its impact on developing country trade and commercial development. As with any large investment, merchant marine development is only one possible use of limited national funds (opportunities exist in other industry sectors such as fishing, mining, and tourism). The results of this study suggest that the existing national-flag fleet brings various benefits to Colombia including: direct and indirect employment, favorable balance of payments and improved national defense. However, those results also suggest that an expanded Colombian fleet is not likely to lead to significant additional economic benefits. For example, a key question is whether having more Colombian vessels will result in more Colombian international trade. In general, one would not expect the vessel flag to have a significant impact on the volume of trade. Colombia appears to be receiving competitive prices on its movement of bulk goods and receives adequate direct liner service. Therefore, the degree to which an increase in the number of Colombian-flag vessels would positively influence the volume of international trade is considered minimal.

The impact of an expanded fleet on the country's balance of payments (BOP) is another relevant consideration. New vessels will typically be purchased outside Colombia, creating a negative balance of payments impact. Other factors in the BOP calculation for an expanded merchant marine include: crew wages returning to Colombia (and wages to foreigners on Colombian-flag vessels that will leave the country), profits of new vessels, and increased shorebased expenditures using more Colombian-flag vessels rather than foreign-flag vessels. Overall, it is not likely that an expanded fleet will positively impact the Colombian BOP.

A merchant marine can serve many functions in aiding a country's defense and security. In wartime a merchant fleet is valuable in providing logistical support to the armed forces. A national-flag fleet can also insure that commercial trade continues during a military conflict. In peacetime a merchant fleet may assist a government by helping to patrol a 200-mile limit or aid in spotting water-related smuggling activities. But to what extent

could an expanded merchant marine aid Colombia in national defense/security activities? From the limited amount of information available on this topic, the presence of additional Colombian flag vessels would appear to have little significant or direct impact on Colombian national security.

It is important in choosing between state-owned and privately-owned fleets to determine whether there are significant cost differences in their operation. In terms of national defense/security benefits, Colombia may wish to determine if significant differences exist in the amount of control the government could exert over state-owned versus privately-owned ships.

The Colombian Port and Harbor Sector: In the 1960s, Colombian ports were among the most productive in Latin America, but slow growth rates in port capacity and the lack of significant infrastructure development have had a negative impact on national port productivity. The results of this study suggest that four issues are of particular importance to future Colombian port planning. First, the complementary components of plan development are short-term planning that emphasizes improvements and repairs of existing structures and long-term planning that incorporates port modernization and equipment upgrading. Planned expenditures by COLPUERTOS for the rehabilitation of existing facilities and for the acquisition of new equipment are designed to offer a short-term solution to existing port handling problems. With other plans to increase rotation rates and productivity, COLPUERTOS hopes to expand the usable capacity of Colombian ports by 15%, to meet projected needs to the year 1990. However, these short-term solutions are not sufficient for the longer-term development of the economy, and are not designed to be. Because of the dynamic nature of port technology development, planners must anticipate the introduction of innovations that could give Colombia a technical advantage over other countries in the region.

Second, in an area of rapid technological advance, existing port labor practices deserve ongoing evaluation. Along with consideration of physical infrastructure, questions of overall transportation efficiency and costs hinge on the costs and efficiency of labor operations. High wages, extended family benefits, and inefficient labor practices all contribute to Colombian port labor costs being among the highest in Latin America. However, beyond the cost of labor, planning the introduction of container terminals to replace

break-bulk cargo facilities (or the introduction of other technical advances) requires a re-evaluation of existing labor rules and practices.

Third, since questions of port infrastructure and labor cost are more easily quantifiable, there is a tendency to stress them in port planning. However, an efficient, well-trained port administration that reflects changes in port practice brought about by technological advances is also critical to plan development. Indeed, effective management and adequate investment capital can be equally critical resources when considering improvements in port performance. It is, therefore, important to future port development that manpower constraints be minimized, implying a need for the training and retraining of management--a policy that constitutes an essential and low-risk investment for ports.

Lastly, the study suggests the importance of integrating port planning with other national transportation plans to increase the overall effectiveness of marine transportation. This is particularly important given the worldwide move to containerized cargo. The farther a container can pass through the distribution system before being broken down into its component packages, the greater the economic benefits will be. The advantage of a box system can be lost unless there is maximum "penetration" toward final markets. Container port facilities would prove fruitless if the rest of the transportation network is not capable of handling their throughput. This aspect of the port containerization equation would seem to warrant more careful scrutiny.

5. TOURISM AND COASTAL DEVELOPMENT

In the last decade tourism has played an increasingly important role in the economy of Colombia, especially as a generator of foreign earnings. Estimated roughly at about one-third of total tourism as measured by location and numbers of hotel rooms and jobs, coastal tourism figures prominently in government plans to increase still further the contribution of international tourism to the foreign exchange balance of the country. Expansion of coastal tourism will come primarily along the Atlantic coast and Colombia's Caribbean islands, given the existing transportation network, identified sites with tourism potential, and the relative proximity to tourism markets in North

America. While the Pacific coast also has the potential for tourism, the lack of basic infrastructure will probably limit the near-term development to one or two presently accessible areas.

Some futurists predict that tourism could become the world's biggest single industry by the end of this century. This growth projection could bode well for Colombia with its favorable location, its rich cultural attractions and its inviting Atlantic coastline. The contribution of tourism to total foreign earnings ranged between 10% and 15% through 1981. Tourism also is an important generator of employment in Colombia. The sector currently employs approximately 1% of the economically active population. Between 1976 and 1980, the number of tourism-related jobs increased by about 35%.

The Atlantic coast plays an important role in Colombia's tourism. The attractions of the Atlantic coast center on both the natural environment and the remarkable Spanish architecture and culture which are found in the region, most notably in Cartagena. Santa Marta and Cartagena have become major tourist destinations for both international and domestic tourists with increased flow continuing to the islands of San Andrés and Providencia, as well. Based on the number of hotel rooms and related facilities, about one-third of the nation's tourism activity is centered in this region. Colombia's Pacific coast is approximately as long as the Atlantic coast but is virtually undeveloped. Difficulties in access, lack of good harbors, and unfavorable climatic conditions have greatly slowed development there.

The government tourism program is administered by the national tourist organization--the Corporación Nacional de Turismo (CNT or Colturismo)--and is guided by a national tourist development plan. The objective of the plan is to develop foreign and domestic tourism by increasing the supply of facilities and attractions. CNT gives the following justifications for government support of tourism development: it produces foreign currency, generates jobs and redistributes income, assists regional development, assists depressed regions, generates government income, and strengthens national identity.

Two observations suggest that the potential exists to provide for continuing growth in international tourism to Colombia: 1) South America's share of world tourist flows will increase as the diffusion of tourism into

less developed parts of the world continues; 2) Colombia should be able to obtain an increasing share of international tourism in South America and of resort tourism to the Caribbean, particularly with more attention to promotional efforts. Colombia should be able to increase its subcontinent share, given that its rate of growth in tourism approximates that of the South American leader, Brazil, and that its markets should be fully as productive as those of Brazil, especially considering the rapidly growing Japanese market.

Given intense competition in the international tourism market today, Colombia will capture and retain a larger market share only if it maintains its tourism assets and attractions (both natural and cultural) at the highest possible levels. Tourism considerations appear to have received little attention in the expansion plans of major ports, new industrial development, or urban planning and, while plans are developed by agencies of the national government, cooperation between these agencies, the departments (states) and local governments seems weak or nonexistent.

Increased commercial and industrial development is certain to occur along Colombia's Atlantic coast, and with it environmental problems, just now emerging, could worsen. Therefore, coordinating the process of planning and developing the Atlantic coastal region is crucial. While tourism may be the long-term beneficiary of such a process, all uses and users of the coastal zone (maritime, industrial, residential, urban) will benefit from a properly designed program and the Pacific coastal region could also benefit from a well-designed program when development pressures warrant such efforts there.

A successful coastal zone management (CZM) program would encourage and support sustainable uses of the natural resources of the coastal zone while endeavoring to reduce or mitigate the adverse impacts of other forms of necessary coastal development. Two of Colombia's neighbors--Ecuador and Brazil--presently have coastal zone management under consideration, in both cases triggered by development pressures along portions of their shorelines.

The decision to begin preparation of comprehensive coastal management programs for the coastal regions of Colombia is a next logical step. That decision can only be taken when the leadership of the government is presented with a convincing proposal that has been prepared by the Colombian agencies

having the important ocean and coastal responsibilities. Those agencies have both the responsibility and the competence to undertake the preparation of such a proposal, and unless they see the urgent need for doing so, the effort will, in any case, fail. The rich and varied coastal zones of Colombia can provide economic benefit and aesthetic pleasure to countless generations of Colombians and their visitors, but only if steps are taken now to plan and manage these unique areas in a comprehensive and sensitive manner.

6. INSTITUTIONAL CONSIDERATIONS

The following observations are suggested after reviewing the relevant legislation, documents, and the data collected in interviewing representatives of the major governmental organizations (e.g., DIMAR, CCO, INDERENA, CNT, COLCIENCIAS, COLPUERTOS, INGEOMINAS, ECOPETROL, DNP):

- The level of ocean involvement among Colombian agencies is low, with the exception of DIMAR and CCO for which ocean affairs represent a central concern;
- In general, there is a low level of staff and budgetary resources devoted to an ocean effort, equally true of agencies with a major ocean mission (such as DIMAR and CCO) and of agencies with subsidiary concern in the oceans;
- Ocean activities tend to be located at low levels in the governmental bureaucratic hierarchy, especially in the fishery sector where resource potential would seem to warrant elevating fishery affairs to a higher organizational level;
- There appears to be some lack of communication/cooperation among agencies in different sectors, e.g., fishery and port development are not well integrated with other coastal uses or resources, such as tourism;
- There is some lack of clarity (duplication/overlap) in jurisdictional mandates, particularly in the relationships among DIMAR, INDERENA, and CNT in their respective jurisdictions over coastal lands and waters, among DIMAR and INDERENA over enforcement of fishing regulations, among INGEOMINAS and ECOPETROL in the collection and dissemination of geological data;
- Better inter-institutional coordination and cooperation is needed, e.g., the minerals group at the Sasaima workshop called for the creation of an inter-institutional coordinating committee; the fisheries group called for the coordination and prioritizing of governmental research activities.

An integrated view of ocean policy implies a multidisciplinary perspective involving a variety of disciplines, including the marine sciences, political science, economics, anthropology and law, and implies consideration of the interconnections that occur among diverse ocean sectors. The ability to make comparisons among sectors is also crucial if government is to make rational investment choices and establish development priorities among various sectors.

Because intersectoral choices must ultimately be made, the creation of a master plan for marine resources management will necessarily involve a much more difficult, controversial, and protracted process than the creation of the 1980 science and technology development plan. We will attempt to provide some tentative assessments about which sectors appear to offer the most immediate potential, at least in the near term. We see the potential contributions of different marine sectors to the national goals, enunciated in the 1983 national development plan (Cambio con Equidad), as follows:

- Increased employment with most promise in coastal tourism and fisheries sectors;
- Foreign earnings with the largest potential in coastal tourism and the minerals/energy sectors;
- Regional development with the largest potential in coastal tourism;
- Increased protein with the fisheries sector offering the potential to help lift the protein levels in the population.

The core elements of the present Colombian ocean governance system are:

(a) general policy pronouncements on the importance of the oceans as a means to increased national development and a specific governmental plan of action to develop marine sciences and technology to support future economic development efforts in the ocean and coastal zone, e.g., the 1980 DNP plan;

(b) a principal maritime agency having responsibility for a significant number of ocean science activities--DIMAR; (c) a coordinating commission comprised of representatives from agencies involved in ocean activities--CCO; (d) a special fund to support new ocean science and technological activities--FONDEMAR; and, (e) an array of other agencies conducting activities that are connected in some manner with the oceans or the coastal zone, e.g., INDERENA, INGEOMINAS, COLPUERTOS, CNT.

The major institutional challenges for improving Colombia's coastal and marine resources management, in our estimation, lie in two areas.

(1) Completion of work in progress to develop an improved capability in ocean sciences and technology, which could be accomplished by:

- Strengthening of FONDEMAR through regular and predictable annual appropriations;
- Disposition of FONDEMAR funds with CCO having greater input into the decision-making process for approval of projects and programs to be funded through FONDEMAR;
- Increased funding for DIMAR, which with the weight of its responsibilities needs to receive an increase in its annual budget, especially including financial assistance for the operation of its research ships;
- Funding of the research ships, Providencia and Malpelo--The new research vessels represent an opportunity for Colombia to obtain the additional ocean information and data required for many purposes, and the costs of operating these ships should be spread over Colombia's entire ocean program since all of the involved agencies benefit from the research work done on the ships.

(2) New efforts in formulating management regimes for the development of Colombia's marine and coastal resources.

Marine development policymaking should be placed at a sufficiently high level in the governmental bureaucratic structure to allow the governing entities to make choices from among alternative development paths. The kind of policy analysis and government investment planning expertise needed is available in the Department of National Planning. The department is located at a high level in the governmental hierarchy, overseeing as it does the formulation and implementation of agency programs, but no focal point for ocean resources development, however, presently exists in DNP.

Our first recommendation, hence, is to consider the creation of a professionally staffed office of ocean resources management within the DNP, responsible for overseeing the formulation and implementation of ocean and coastal programs in the agencies with marine mandates. As the focal point for long-range planning efforts for development of marine and coastal resources, this office would shape investment recommendations for the consideration of higher governmental authorities.

Second, consideration should be given to enlarging the Comisión Colombiana de Oceanografía (CCO) to incorporate a new Consejo Nacional de Desarrollo de los Recursos Marinos y Costeros (a national marine and coastal resources development council) that would serve as an ocean and coastal resources policy coordinating group to bring together the government agencies in other institutions involved in marine resources development, and would advise the DNP unit on appropriate policy directions.

Third, we recommend creation of a new fund to provide financial support for both the new office in DNP and for specific development projects in the various ocean resources agencies. The fund might be comprised of taxes raised on the imports of marine resources that could be produced within the country.

Fourth, we recommend the elevation of marine fisheries within the government structure to give fisheries more visibility, more autonomy, and easier access to additional resources. With the potential that exists for expanded fisheries activity on the Atlantic and Pacific coasts and in aquaculture, we believe the time is approaching when consideration should be given to convert the present Ministry of Agriculture to a ministry of agriculture and fisheries.

Fifth, a broad ocean awareness educational program should be established. Efforts by the government of Colombia to heighten attention on marine resources development should be in tandem with efforts to make Colombian citizens more aware of the importance of the country's oceans.

The role that ocean and coastal resources can play in the further development of Colombia is not clearly defined at the present time. The range of possibilities is large and the potential benefits many. Colombia can make informed choices among alternative development strategies if it starts now to build the necessary policy analysis and decision-making competence and to create the required new institutional arrangements in the marine resources area. The scientific and technological foundations are being laid. The time for the next step is at hand.

CHAPTER 1

INTRODUCTION: COLOMBIA AND THE CHALLENGE OF MANAGING COASTAL AND OCEAN RESOURCES

Biliana Cicin-Sain

A. The Challenge of Managing Coastal and Ocean Resources

The concept that coastal states ought to have jurisdiction over the living and non-living ocean resources found within 200 miles off their coasts --which Latin American nations pioneered in the late 1940s--is a notion which has won worldwide acceptance and recognition. The signing of the Law of the Sea Convention by 119 nations in Jamaica in December 1982 and the U.S. Presidential proclamation of March 1983 declaring U.S. jurisdiction over a 200-mile exclusive economic zone (EEZ) represent but the latest of a long series of national and international actions which have served to legitimize coastal state jurisdiction over ocean resources found within 200 miles offshore (Cicin-Sain and Knecht, 1983).

Although the principle of coastal state jurisdiction over the resources of its adjoining EEZ is now well established--in both national and international law--the actual practice of managing coastal and ocean resources is generally in an embryonic stage of development worldwide. While the attention of many nations is turning seaward toward the new ocean areas they now control (which, in some cases, are larger than their land masses), most nations find themselves lacking the necessary concepts, methods, and economic and political institutions to deal with these new areas. The EEZ is thus, in most cases, only a de jure reality. For it to become a de facto reality, no doubt several decades will need to elapse.

Latin American nations have been very instrumental in forging the juridical concepts underlying the EEZ which have now become embodied in the Law of the Sea Convention (Vargas, 1981, Szekely, 1979). However, these

contributions generally have been oriented toward international law and not toward domestic management of ocean and coastal resources, and have largely involved individuals located in the foreign affairs offices of each country, not in the domestic bureaucracies. With the exception of fishery development in the 200-mile zones of some Latin American nations (most prominently, Peru, Mexico, and Ecuador), the experience with domestic management of the EEZ in Latin America is rather limited (Primer Curso Latino-Americano Sobre Planificación de los Recursos Marinos, 1983).

The challenge of domestic management of ocean and coastal resources is to manage the multiple resources and uses of the sea and shoreland for the long-term benefit to the people of the nation. Our definition of "management" is broad and includes the entire range of activities designed to develop and to conserve ocean and coastal resources for present as well as for future generations. Management to us thus means both development and conservation, because no sustained development is possible without rational conservation. By multiple marine resources, we refer to the entire gamut of ocean and coastal related resources and activities--e.g., fisheries and aquaculture, oil, gas and other energy resources, marine minerals, marine transportation, coastal tourism, marine recreation. Because of the common property nature of most marine resources (Friedheim, 1979), in the notion of "long-term benefit to the people of the nation," we include the idea of social equity in the distribution of benefits which accrue to the exploitation of ocean resources; these should contribute to an enhancement of the quality of life of the nation as a whole.

In most nations, some ocean activities (such as marine transportation, management of ports) are already partly being managed through existing laws and regulations. Other, less developed marine activities, such as the extraction of marine minerals, are often thought of as extensions of land-based activities, such as land-based mining, which are already managed by existing laws and bureaucracies. While in certain respects this is an appropriate way of viewing the management of specific marine sectors (e.g., marine transportation policy can be conceived of as part of a national transportation policy; offshore oil and gas exploitation can be thought of as part of a national oil and gas program), wholesale application of land-based management concepts and practices to the management of marine resources is not

entirely satisfactory. The crafting of effective regimes for managing ocean and coastal resources ought also to be responsive to the distinctive characteristics of the ocean and of the coastal zone, and of the human activities associated with these areas.

Ocean and coastal management

The object of ocean and coastal management--the ocean and the coastal zone, and the human activities associated with these areas--involves at least three different aspects or components (Armstrong and Ryner, 1981):

- (1) the natural ocean system which includes (a) ocean space (the surface waters, the water column, the seabed and the subsoil), (b) ocean resources (such as fish and mineral deposits) and (c) ocean dynamic systems (such as thermal patterns, currents, tides);
- (2) Ocean uses and ocean activities (such as fishing, navigation, offshore oil and gas exploitation, recreation); and
- (3) Government programs and policies designed to affect the two aspects above.

Traditionally, observers have stressed that the natural ocean system exhibits characteristics which, although also present on land, tend to be emphasized in the ocean setting--vastness, infinity, fluidity, mobility, and interdependence of resources and processes (Brown et al, 1977; Friedheim, 1981; Wooster, 1969; Wijkman, 1982; Crutchfield, 1982). The vast ocean medium, which occupies over 70% of the planet is aptly described in a report by the International Union for the Conservation of Nature and Natural Resources (IUCN, n.d.):

The sea is much different in character than the land. While the atmosphere contains very little life, the hydrosphere contains the greatest variety of life on earth. While life on land is but a few meters thick, life in the sea occupies the entire water column. And, while the air currents transport relatively little biological material, the ocean currents carry plants, animals, and organic and inorganic substances from land and sea. Entire "clouds" of nutrients and planktonic life move by ocean currents to supply ecologic functions far removed from their source. Different stages in the life cycles of marine animals very often inhabit entirely different ecosystems.

Other differences are relevant to any consideration of managing the seas. The downstream effect in the ocean far exceeds that on land. The chain of events between primary productivity and secondary and tertiary productivity may be far removed in space because of ocean currents. Similarly, pollution's effects may be hundreds of kilometers removed from the source. This makes it necessary to view individual organisms and places of interest to humans in far different spatial terms than is familiar in terrestrially-oriented thinking. That is, marine ecosystems, in terms of relationships between organisms, nutrients, and perturbations, are seen in terms of whole segments of oceans.

These distinctive characteristics of ocean processes and resources have influenced how humans have traditionally used the sea. The fluidity, vastness, and ubiquity of ocean space are what has allowed man to use the ocean as a major transportation and communication medium from time immemorial--carrying goods, ideas, and war, and bringing faraway lands closer together. The worldwide mobility of some living marine resources such as tunas has led to the development of sophisticated distant-water fleets which are "as mobile as the fish themselves" (Felando, 1983). The mobility of ocean resources and the great depths and distances involved in ocean space have, in addition, made exploitation of many marine resources technologically difficult and costly. In many ways, the ocean environment is one that is inhospitable to humankind, both in terms of knowledge and access. Lack of information about the intricate patterns that intertwine living marine resources, for example, has traditionally baffled fishermen and fishery managers alike. Exploitation of mineral resources offshore has, in turn, had to await the development of sophisticated technology and the availability of significant financial resources. In many cases, exploitation of land resources remains more feasible and less expensive than exploitation of similar resources in the ocean.

In a similar vein, the coastal zone--the area where the land and sea meet--exhibits distinctive characteristics which should be taken into account in the crafting of management regimes. At their meeting place, the land and the sea greatly affect one another, making the coastal zone both a highly productive and a fragile environment. The rivers of the land empty vast quantities of sand, silt, nutrients, chemicals and fresh water into the sea, markedly affecting its properties. The richest, most productive parts of the

sea occur in the highly fertile nearshore waters. As the land affects the sea, so too the sea affects the land--modifying its climate, transforming its shape through erosion and accretion, watering its lowlands, and occasionally, visiting its full fury on the land with disastrous consequences on ill-situated life and property.

From a human use perspective, land situated in the coastal zone is generally highly valuable--in some cases because of the inherent beauty of the shoreline, its beaches, and dunes; in others, because of the siting of industrial and commercial uses requiring access to the sea and its transportation lanes. The ocean space adjacent to the land is also highly valuable for it is generally here that the variety of human uses of the ocean--from fishing and aquaculture to recreation, to transportation, to minerals exploitation--originate. Hence, the coastal zone--the shoreline and the land and sea immediately bordering it--is a special place that demands special attention. Planned and properly used, the zone can serve many users on a sustainable basis; abused and misused, on the other hand, it can lose much of its value in a remarkably short time.

Ideally, the distinctive characteristics of ocean and coastal resources and systems, and of the human uses associated with them, should be taken into account in designing ocean and coastal government programs and policies. Perhaps the major management implication which flows out of these distinctive characteristics is that proper management of ocean and coastal resources and activities should consider the interconnections among different marine sectors and uses; for example, the impact of oil development on fishery productivity, or the connection between industrial port development and coastal tourism. "Integrated ocean and coastal resources planning," moreover, implies that an effort is made to weigh or optimize environmental protection, public use, and economic development. Integration also assumes coordination between data gathering and analysis, planning, plan making, implementation and construction (Sorensen, McCreary and Hershman, 1983). Hence, countries embarking on efforts to create management systems for ocean and coastal resources and uses under their control should strive to do so through a comprehensive and integrated management approach that: (1) takes into account the interconnections among different ocean and coastal resources and uses, (2)

considers and optimizes alternative uses (e.g., development, protection), and (3) integrates planning with administration and implementation.

This "ideal" of integrated and comprehensive planning (which is discussed in Chapter 6 of the report), however, will be difficult to achieve, in part because there are partial management mechanisms governing different ocean sectors and activities already in place. Each of these is represented by its own set of government institutions and processes, and private interests--all of which will generally exhibit reluctance to wholesale change. Thus, we note at the outset of this report that, although we will emphasize the challenges of integrated ocean and coastal management, we will not necessarily be suggesting that new comprehensive institutions will be needed to meet these challenges. Although creation of some new institutions may be desirable to highlight the importance of ocean resources and to catalyze attention on them, given the wide scope and range of ocean resources and activities, as Machado Rego points out (1981), their management will always involve numerous agencies of government and numerous interest groups. Effective coordination of these agencies and groups thus will always be a major requisite for successful ocean and coastal management.

Whether ocean and coastal zone planning entails the creation of new institutions, it should be understood that development of frameworks for coastal and ocean resources management will inevitably entail a move toward increased complexity. As undeveloped marine sectors begin to be managed and as sectors that are already developed are developed further, the interest and involvement of different government agencies, private sector groups, and academic groups will heighten. New actors will enter the political and bureaucratic arena. As existing organizations acquire new marine-related functions, they will no doubt need to undergo considerable change; for example, the nature and capabilities of their personnel may need to undergo transformation and additional personnel training may need to take place. As new agencies are created or new private groups mobilize to take advantage of new ocean resource opportunities, existing agency and public/private relationships will also undergo change and will tend to become more complex and less predictable. In short, planning for ocean and coastal zone management will not only entail a new set of activities, but also the

development of new processes which will involve new interactions among agencies and private groups. Proper planning will anticipate the types of changes that this process of increasing complexity will inevitably bring about, and minimize potential adverse impacts.

B. Colombia and Ocean and Coastal Management

In a recent presentation, Dr. Agustín Ayala Castañares, Chairperson of the Marine Sciences and Limnology Department at the Universidad Nacional Autónoma in Mexico City, characterized the obstacles that Latin American countries face in the development of the potential of the oceans in the following way (Ayala Castañares, 1983).

At the governmental level, he posited, there generally exists a state of ignorance regarding the complexity and value of ocean resources and the need to view them through an integrated approach; marine science and technology have not been given sufficient prominence nor funding; ocean development is not a priority in national development; ocean issues are approached in a fragmented way and there is insufficient coordination among government agencies; international cooperation is underutilized.

At the scientific and technological level, there is a lack of trained personnel, particularly at the post-graduate level; marine facilities and equipment are inadequate, libraries have significant gaps and are ill organized; access to research vessels is difficult and ship maintenance budgets are low; basic oceanic services (such as cartography) are inadequate; knowledge of marine resources in the EEZ is very poor and most countries lack the capability to study these resources. At the socio-economic level, moreover, there is a lack of a scientific tradition necessary to support large-scale investment in the marine sciences; in general, scientists are undervalued and underpaid.

While Colombia clearly faces some of the same problems discussed by Professor Ayala Castañares, it is our impression that the current situation in the country exhibits a variety of ingredients necessary to launch an

accelerated ocean development effort. First, ocean and coastal areas under Colombian jurisdiction are indeed extensive. With the advent of Law 10 of August 4, 1978, which established the Exclusive Economic Zone, Colombia assumed jurisdiction over a marine area of approximately 988,000 km², equalling 87% of the continental area of the country (See Figure 1.1) (DNP, Plan de Desarrollo de las Cien. y Tecn. del Mar, 1980). The Pacific coast, which is still largely uninhabited and very underdeveloped, extends 1,392 km from the border of Panama in the north to Ecuador in the south. The Caribbean coast, much more densely populated and developed, extends 1,560 km from the Panamanian border in the Southwest to Venezuela in the northeast. Few nations in the world have such extensive coastlines on two different seas, with all the potential development of different types of resources that such ocean access may ultimately entail.

Second, good groundwork for an effort to develop the Colombian coasts and oceans has been laid in recent years. Initially, beginning in the late 1800s, Colombian marine policy was dominated by internationally-oriented concerns related to the definition of the limits of its maritime jurisdiction, and involving protracted international legal disputes, most prominently with Venezuela and with Nicaragua over the San Andrés Archipiélago. Colombia's marine policy was hence initially dominated by personnel in the Ministry of Foreign Relations. Observers credit the active participation of this foreign corps as partially responsible for the ultimate acceptance of the dual concept of a territorial sea of 12 miles and a patrimonial sea of 200 miles in the Third United Nations Law of the Sea Conference--corresponding to Colombia's dual status as a "Pacific" nation on one coast and as bordering a regional sea on the other coast (Stargardter, 1983).

Beginning in the early 1970s, as the delimitation issues began to be settled, other governmental actors undertook a leadership role in the development of marine policy--most prominently, the Navy (the Armada Nacional) and its Dirección Marítima y Portuaria (DIMAR) (created in 1971) and the Comisión Colombiana de Oceanografía (CCO), an interagency coordinating committee on ocean research created in 1969. Together with the national research organization, COLCIENCIAS (Fondo Colombiano de Investigaciones Científicas y Proyectos Especiales "Francisco José de Caldas"), these

organizations sponsored a series of national symposia on the development of the marine sciences and technology in Colombia in 1971, 1973 and 1977. The first Seminario Nacional de Ciencias del Mar identified the need for formulating a National Plan for the Development of Marine Science, which was ultimately developed by the Departamento Nacional de Planeación (DNP, the national planning office), in conjunction with CCO, COLCIENCIAS, and other Colombian agencies with advice from UNESCO and the United Nations Development Programme (DNP, Plan de Desarrollo de las Cien. y las Tec. del Mar en Col., 1980). The 1980 document set forth a detailed plan for the short-range and long-range development of marine science and technology, and for obtaining the necessary knowledge on Colombia's marine resources. Although the marine sciences plan has not yet been fully implemented (Steer, memo, 1982), it appears that significant strides have been made in meeting its goals, thus partially providing the base for the second and present stage in planning--that is, how can these marine resources be best managed for the long-term socioeconomic benefit of the people of Colombia? The need for a plan oriented toward development and management of marine uses, rather than solely science development--the Plan Maestro Desarrollo Marítimo--was first formally proposed at the third symposium on marine sciences in 1977.

Third, there appears to exist a new political will to develop ocean resources--there is an apparent readiness on the part of current government representatives to take positive steps in this area. This is evident in a variety of ways. In various speeches and administrative actions, the President of the Republic, Belisario Betancur, has exhibited both moral and tangible leadership in ocean affairs (Betancur, 1982). The Navy's DIMAR--the major ocean agency in Colombia and the primary client of our current effort--has been a leader in proposing and sustaining the effort necessary to put into place new ocean policy initiatives. The CCO has recently been restructured through Presidential decree to achieve more effective organization (El Espectador, 13 February 1983). A new source of funding for ocean research projects, FONDEMAR, (Fondo Para el Desarrollo de las Ciencias y las Tecnologías del Mar) has recently been established to promote the much needed collection of ocean resources data within the context of the 1980 plan (Decree No. 416, 12 February 1983). Similarly, the interest and willingness of many other agencies to participate in ocean development efforts became

FIGURE 1.1

COLOMBIA'S EXCLUSIVE ECONOMIC ZONE

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SOURCE: DNP, "Plan de Des.", 1980.

amply evident to us in our field visits to Colombia in the past year. Although coordination among all of the different agencies and organizations with a role in coastal and ocean management will be difficult to attain, the necessary ingredient of interest on the part of the relevant agencies seems to be present.

Fourth, Colombia is fortunate to have a small cadre of highly capable marine activists and thinkers in such entities as DIMAR, (particularly in its CIOH unit), COLCIENCIAS, and CCO--individuals with a vision of the potential of the oceans and of how to realize this potential. These are individuals who are making important contributions to conceptual development in ocean management not only nationally, but internationally as well.

Fifth, Colombia is at a good point in the ocean planning process. Precisely because it is still at an early stage in ocean development and because it has good leadership, the opportunity exists for the development of ocean resources to proceed in an orderly and well-planned manner. Colombia has the opportunity and the leadership available to study carefully how other nations have approached the development of ocean resources. Through such analytical efforts, it may avoid the mistakes made by others and profit by examples of success.

In summary, a variety of factors suggests that Colombia is at a critical juncture in ocean development. Obstacles do exist, but there are opportunities and good leadership as well. Given a situation of limited resources and keen competition from non-marine sectors, it would seem that the next few steps in ocean development will need to be chosen very carefully, for ocean activities will need to "prove" themselves to gain more overall stature and recognition--which will then work in turn to attract more interest and investment.

Before discussing these possible steps more specifically, we briefly review the nature of the cooperative effort between the Marine Policy and Ocean Management Center at the Woods Hole Oceanographic Institution (MPOM/WHOI) and the Colombian government, and of the work conducted to date.

C. Towards the Development of a Master Plan for Marine Resources
Management in Colombia: The Role of MPOM/WHOI

In late 1981, the MPOM/WHOI received a grant from the William H. Donner Foundation of New York City to study techniques for assisting developing nations in the formulation and application of marine resources development policy. Shortly after a workshop was held in Woods Hole in April of 1982 to discuss the new program, the Director of the Colombian Navy's Office of Ports and Merchant Marine (DIMAR), Capitán de Navío Humberto Cubillos, contacted WHOI to express an interest in the program; Colombia was the first nation to do so.

Further discussions led to an exploratory trip to Colombia in June 1982 by David A. Ross, Director of the Marine Policy and Ocean Management Center at WHOI and Robert W. Knecht, a Senior Fellow in MPOM. In September of 1982, a three-person delegation from MPOM/WHOI--Robert W. Knecht, Maynard E. Silva and James M. Broadus--spent a week in Bogotá working on a "framework agreement" for a cooperative program involving DIMAR and MPOM/WHOI. Commander Rafael Steer Ruiz, Director of DIMAR's CIOH (Centro de Investigaciones Oceanográficas e Hidrográficas), was designated as the official Colombian counterpart to the project and as the leader of the Colombian effort (Plan Maestro de Desarrollo Marítimo). The framework agreement, slightly amended during brief meetings in Bogotá in February 1983 and in Woods Hole in March 1983, has served as a description of the agreed program, setting out the roles and responsibilities of the two institutions. Basically, a three-step plan was to be followed, with DIMAR principally responsible for phase I, description of the actual situation in coastal and marine resources management, MPOM/WHOI responsible for phase II, diagnosis of the situation, and DIMAR responsible for phase III-- formulation of a national master plan for marine and coastal resources development.

Program teams were organized in MPOM/WHOI and in DIMAR during the Spring of 1983 with the field phase of the effort taking place in May and June. During a three-week period in May 1983, a three-person team from WHOI--Robert W. Knecht, Bilianna Cicin-Sain and Maynard E. Silva--with the active support of DIMAR, conducted a series of interviews in Bogotá, Cartagena, Santa Marta and Barranquilla with over 30 representatives from different ocean and coastal

agencies and groups. Information was sought on agency missions with respect to resources, funds and staff available for the ocean effort, plans under consideration, perceived problems, etc. (see Appendix A for a list of organizations visited and a summary of major questions posed). During these interviews as well as throughout the project, the WHOI team stressed the objective and impartial nature of its effort as uninvolved third-party observers.

A caveat about these field data is that the WHOI team was able to visit and interview agency personnel only in the capital and in Caribbean coast cities. Due to a port strike, a planned visit to the ports of Buenaventura and Tumaco on the Pacific coast did not materialize. Hence, first-hand observations are limited to the Atlantic coast.

The second major field activity of the project was the Workshop on Marine Resources Development, organized and funded by DIMAR, and held in Sasaima, Colombia on June 20-24, 1983. The Workshop brought together representatives from most of the ocean-related organizations in Colombia, both public and private, for a discussion of current ocean and coastal related programs, as well as problems and opportunities in the development of different marine sectors. The recommendations contained in the report emanating from the Sasaima meeting, prepared by DIMAR and based on the inter-agency discussions which took place at that meeting, played a prominent role in the formulation of the present report.

In September 1983, four staff members of the DIMAR team--its Director, Capitán Rafael Steer Ruiz, Amparo Ramos Mora, Carlos G. Robayo Osorio, and Carlos Moros--travelled to Woods Hole for a three-week working session with the WHOI Team. This productive visit included discussion sessions and visits aimed at elucidating the U.S. approach to various types of marine resources management (offshore oil, fisheries, nearshore marine parks, coastal zone management) as well as more focused work on the Colombian marine situation. A more detailed report on this visit is given in Appendix B.

Between November 1983 and March 1984, sections of this report were completed in draft form and made available for comment to the DIMAR team. The final version of the report was completed in May of 1984 with the assistance

of Leon Bolaños, a DIMAR staff member, who travelled to Woods Hole to participate in the final report preparation effort.

As is evident from this review of the chronology of the project, from the outset, the program has been a fully cooperative one, with DIMAR and MPOM/WHOI involved at every stage. The WHOI team gratefully acknowledges the assistance that it received from DIMAR. Without it, completion of the study would have been impossible.

Against this background and before we turn to the analysis of problems and opportunities in each marine sector, we think it important to set forth our views on the role and functions of international collaboration in the formulation of plans for marine resource development. In our view, creation of a comprehensive, well thought-out and realistic plan with good chances for implementation success involves a dynamic and organic process which obviously must be done in-country, and in which all affected interests (both public and private) must become involved. The role of international collaboration is not one of actual plan formulation, but instead, one of offering external third-party objective assessment and observations based on comparative experience. More specifically, in our view, the international collaboration role can be most useful and is more appropriate when it is focused on the following types of activities or tasks:

1. Assessment of overall direction/organization:

- a) To assess and comment on overall directions in ocean development, using, to the extent allowed by the available data, comparative experience from other nations (including both the regional context and world trends).
- b) To assess and comment on alternative organizational approaches for ocean and coastal resources management. How can the ocean effort be organized most effectively? Might reorganization, creation of new institutions, new funding sources be useful?

2. Assessment of directions in specific marine sectors:

- a) To diagnose the current situation and potential for growth in each marine sector, i.e., marine fisheries and aquaculture, ocean energy resources and minerals, marine transportation, coastal zone resources and their utilization.
- b) To formulate intersectoral comparisons to the extent allowed by the available data and the poorly developed methodology in this area. Given the nation's limited investment resources, what sectors appear to be most suitable for expansion?

3. To assist in starting (or strengthening) the inter-agency process which is inevitably involved in ocean and coastal development. As discussed earlier, ocean management planning will involve a move toward increased complexity, bringing new actors and institutions to the fore. On the basis of comparative experience on political and bureaucratic processes involved in marine resources management in other countries, to suggest what processes may be suited to the Colombian situation and what considerations ought to be taken into account to achieve effective inter-agency coordination.
4. Finally, to provide a forum for the expression of innovative and creative ideas which may emanate from different sources within the country, and which, precisely because they are innovative, may face difficulties in finding an outlet for expression within established channels.

With these considerations in mind, we turn now to the analysis of major problems and opportunities facing the primary marine sectors in Colombia, and of the overall institutional considerations that are involved: Fisheries and Aquaculture (Chapter 2), Ocean Minerals and Energy (Chapter 3), Marine Transportation and Ports (Chapter 4), Tourism and Coastal Development (Chapter 5), and Institutional Considerations (Chapter 6).

CHAPTER 2

FISHERIES AND AQUACULTURE

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I. FISHERIES: STATUS AND PROSPECTS

A. Introduction

Colombia enjoys the advantage of coastlines on both the Atlantic and Pacific Oceans. Developed fisheries on the two coasts (e.g., shrimp, lobster, and finfish) make contributions both to the economic and nutritional well-being of the country. In terms of economic benefits, Colombian fisheries and associated industries, such as the processing of fishery products, provide employment opportunities and foreign exchange earnings. Nutritionally, fish and shellfish contribute to the national supply of animal protein. Although the per capita percentage of fish consumed is small compared to that of red meat consumption, fish products represent an important augmentation of the national diet.

However, Colombia has not realized the full benefits potentially available from its fisheries. The country imports more fisheries products than it exports. The per capita consumption of fisheries products is lower than that of surrounding Latin American nations. Certain fish stocks are either underutilized or not utilized at all. And the industry seems to languish because of a lack of credit for expansion.

This chapter explores the current status and prospects for the expansion of Colombian fisheries production. The discussions are based primarily on Colombian studies, interviews with Colombian personnel, and secondary materials from a variety of sources. First, some current aspects of fisheries in Colombia are examined. This is an abbreviated overview, because many of the points and data have been presented elsewhere (e.g., documents by INDERENA and DNP). The major portion of this section is devoted to observations and

suggestions about considerations on fisheries that should be taken into account in drafting the Master Plan for marine resources development (aquaculture is dealt with in section II of this chapter).

B. Current Status of Fisheries

The Colombian fishing industry should be considered as comprised of two separate, but interrelated, sectors. First there are the industrial fisheries of both the Atlantic and Pacific coasts. Vikings on the Atlantic and Copescol on the Pacific (the largest fishing enterprises in Colombia) are characteristic of this segment of Colombian fisheries production. They use modern vessels and maintain sophisticated processing facilities.

These and similar companies, and the fishermen working for them, primarily target on shrimp and lobster, high value fisheries predominantly destined for international markets. Some finfish are also landed by the industrial fishermen, but this is usually as by-catch from the directed shrimp fisheries. Artisanal fisheries, on the other hand, use traditional methods and produce primarily for the domestic market. While also taking shrimp and lobster, artisanal fishermen tend to be the main harvesters of finfish, which are typically not of high value and are predominantly sold to the Colombian public.

Relative Economic Position

Overall, the fishing industry represents a very small component of the Colombian economy. Moreover, its contribution to the economy has been in a state of relative decline. As reported at the Sasaima Workshop on the Master Plan for Marine Resources Development, the importance of fisheries to the overall Colombian economy declined significantly during the decade of the 1970s. While in 1972, fisheries accounted for only .9% of the GNP, by 1980, fisheries represented only .5% of GNP. The declining importance of fisheries is not one shared by other food producers. In the same period, the fisheries share of agricultural production fell from 4% in 1972 to 2.2% in 1980 (Mora and Polo, 1983).

Employment

The data on the numbers of people involved in fisheries are not very

precise. For example, figures indicate that there are between 10,000 and 20,000 artisanal fishermen working along the two coasts of the country (Robayo, 1983). Even though a specific number is not available (this is not unusual for artisanal fisheries), it is clear that a substantial number of Colombians are economically dependent on maritime artisanal fisheries (Robayo, 1983). The industrial fishing sector is reported to directly employ 5,000 workers either in the harvesting or in the processing phases (Moro and Polo, 1983). A 1980 study by the Departamento Nacional de Planeación (DNP) indicates that 1,152 persons are actively engaged in the harvest of marine fish. Thus, approximately 4000 of the 5000 industrial fishery workers are land-based. While an equivalent figure for land-based artisanal workers is not available, it must be assumed that there is also a multiplier at work here, although probably not as large because of the simpler nature of processing and marketing methods. This is highlighted here to draw attention to the fact that in terms of the number employed, artisanal fisheries have a much greater impact than do industrial fisheries.

Perhaps more important than the numbers of artisanal fishermen involved in marine fisheries is the contribution they make to the total capture of fish. In its diagnosis of artisanal fisheries, INDERENA (1983) provides data in support of this point. Admitting problems with the collection of data, INDERENA nonetheless assumes that between 1974 and 1981, Atlantic coast artisanal fishermen accounted for 72% of the harvest volume on the Atlantic coast (Botero and Lozano, 1983). Far from being an insignificant factor in the harvest of marine fish, artisanal fishermen represent a major component of the Colombian fishing industry.

International Trade

While the industrial fisheries do make a contribution to Colombia's balance of payments, exports of fisheries products, primarily shrimp and ornamental fish, are negated by imports. In 1982, shrimp accounted for approximately 60% of the value of fishery product exports whereas ornamental fish represented 21% of this value. For all years in the period between 1974 and 1982, the value of imported fisheries products was greater than the value of fishery exports. Using 1981 as an example, the value of imported fishery products was US \$82.8 million while fishery product exports were only valued

at US \$33.4 million (Colombian Information Service, 1983).

The striking aspect of the trade deficit is the large growth in both the tonnage and value of fisheries imports; between 1974 and 1981 fishery product imports grew from 30.9 thousand tons worth US \$18.1 million to 98.1 thousand tons with a value of US \$82.8 million. In order of value, the leading fishery product imports for 1982 were fish meal, canned fish, and fish oil (Colombian Information Service, 1983).

There has been some increase in the value of fishery product exports during a similar period but it has not been as dramatic as the increase in imports. Further, much of the increase in the value of exports has resulted not from increased production but rather from increasing prices on the world market. For example, in 1974, 2,744 metric tons of exported shrimp earned Colombia US \$10 million. In contrast, 1982 saw Colombia realize US \$20.5 million in export earning from only 1,723 metric tons of frozen shrimp.

C. Governmental/Organizational Structure and Goals

Organizational Structure

There is generally a sufficient and well-defined authority and jurisdictional scheme for the management of fisheries. With the assistance of the Plan Maestro staff, we have identified 42 other agencies that are also involved with fisheries resources in one way or another. Primary responsibility for fisheries, however, is vested in one agency--the Subgerencia de Pesca y Fauna of the Instituto Nacional de los Recursos Naturales Renovables y del Ambiente (INDERENA).

Goals

Explicit goals have been established for Colombian maritime fisheries. These include the diversification of fisheries, the creation of employment opportunities, enhancement of national nutrition, improvement in the fisheries balance of payments, the distribution of development efforts, and the rational management of fisheries resources (Subgerencia de Pesca y Fauna, INDERENA, 1983). Three efforts are currently underway to begin fulfilling these goals: the development of tuna resources, a proposal for the provision of credit to

the fishing industry, and the creation of a data system for fisheries assessment and management.

Within government there seems to be unanimity about the general goals which have been enunciated for fisheries. Although there is agreement over these objectives, we did find that in some cases officials were unaware of particular goals and/or specific fishery development projects.

Outside of government--that is, among fishery user groups--there appears to be some disagreement over these government-established goals. In particular, some representatives of artisanal fishermen have expressed the view that their interests are being ignored by the current government plans for fisheries development. Most notably, we were informed that there is a general feeling that the Pacific coast artisanal fisherman would not benefit from the development strategies being pursued by INDERENA and other agencies of the Colombian government. It was stressed that fishing is a major source, and in some cases the only source, of livelihood in many areas of the Pacific coast. Thus any scheme which ignores the improvement of artisanal fisheries on the Pacific coast is viewed as a scheme which ignores any meaningful development of the region (Rivera, 1983; Arenas, 1983).

Representatives of artisanal fishermen also raised the concern that there was no formal way for artisanal fishermen to provide input into the fisheries management and development process (Rivera, 1983; Arenas, 1983).

Funding for Fisheries Activities

The level of government funding for fisheries activity is quite low. For example, available data indicate that only 1.1% of the government budget established for agricultural sector research is devoted to fisheries, and of this small amount, only 35% is for marine fisheries (Mora and Polo, 1983). Additionally, there was a general consensus that the development of Colombian fishing potential is hindered by a lack of capital. Private investors are not drawn to fishing because fishing is seen as an industry that involves too many risks.

Enforcement

Current enforcement efforts and coordination between agencies for enforcement purposes appear to be minimal. INDERENA is responsible for fisheries regulation, but it is DIMAR that must enforce them. There appears to be no formal mechanism whereby the regulatory and enforcement agencies can regularly confer on what is needed to achieve fisheries policies.

In terms of deepwater fisheries, the enforcement problem seems to have been one of keeping unauthorized foreign fishermen out of Colombian waters. Of course, with the creation of the 200 mile Colombian EEZ, the importance of enforcing the exclusion of foreign fishermen has become more prominent. There is a much larger area to patrol and secure. Further, as other countries have forced distant-water fishing nations (for example, Japan and the Soviet Union) from their newly created EEZs, the distant-water fishing fleets have begun to look for new areas to exploit. Thus, the distant-water fishing nations are now appearing and harvesting fish in areas they had not previously visited.

If joint ventures or some other method of allowing foreign access to Colombian waters are initiated, then a regulatory vigilance will be required to ensure that foreign vessels are not exceeding their allotted catch. Colombia will also have to guard against foreigners taking species they have not been licensed to capture.

In the past, the inability to enforce exclusions has resulted from a lack of patrol vessels. Recently, however, new vessels have been assigned to the patrol of the deepwater fisheries. It remains to be seen if these additions will be sufficient.

In terms of enforcement of artisanal fishery regulations, a major problem is reportedly the use of illegal and destructive fishing methods, that is, dynamite (INVEMAR, 1983). The major source of this problem is a lack of personnel to patrol inshore waters.

D. Potential

Many of the goals for fisheries development which have been elaborated are

based on the belief that there are untapped fishery resources in Colombian waters. The limited available stock assessments conducted during the last 10 years would appear to support this assumption (these include assessments by the Food and Agriculture Organization of the United Nations, the Japanese International Cooperation Agency, and the Government of Poland). These assessments suggest that there are unutilized stocks of tuna, deepwater shrimp, herring and other species. The assessments may, however, raise as many questions as they answer (see below under Observations and Considerations).

Existing stock assessments also indicate that there are untapped fisheries resources to allow for import substitution of some products (e.g., fish meal), which are now imported and contribute to the negative balance of trade in fisheries products. Possible approaches to redressing the negative balance of trade through the exploitation of untapped fishery resources have not been addressed in any of the documents we have seen. This is an important issue and the Master Plan may wish to direct the appropriate agency or agencies (or the coordinating group for fisheries if one is created) to consider possible alternatives.

E. Observations and Considerations

Organizational Structure

While we feel that there is a sufficient governmental structure for fisheries development we do have some questions. Certainly all of the required activities for fisheries development are included in the responsibilities of the 43 agencies mentioned above. But 43 seems to be an unwieldy number which might prevent the efficiency of action required for effective formulation and implementation of fisheries policy. This suggests that there is a need for a better system of intragovernmental communication on fisheries matters.

As we understand it, the rejuvenation of CONALPES (Consejo Nacional de Pesca) may be an important step in this direction. Comprised of members of relevant government agencies and representatives from the fisheries (industrial and artisanal), this group is responsible for making

recommendations to the Director of INDERENA on fisheries regulation and development. It could become much more. It could also become the major vehicle whereby all those interested in and responsible for fisheries could be kept abreast of the projects, progress, problems, and plans of other member agencies of CONALPES. In this way, a communication network for fisheries could be fostered.

A major problem with CONALPES, however, is that many of the 43 agencies involved in fishery affairs are not represented on CONALPES. If CONALPES is chosen as the organization to coordinate fisheries development activities, then all agencies with a with a major fisheries function should be included in its meetings and deliberations (of course, this might mean that some agencies with only a tangential concern might still be excluded). The same would hold if another organization were chosen for this coordination role. Further, if it were decided that representation by all 43 government agencies/offices would make the coordinating body too large to effectively carry out its role (and this would seem to be the case), then the drafters of the Master Plan should consider recommending the reassignment of some fisheries functions/activities in order to bring the number of interested parties down to a manageable level. CONALPES (or a similar interagency group suggested by the Plan Maestro) should meet regularly and have the authority to make substantive recommendations.

A further note on this subject: where possible, the representatives of the fishery coordination group should remain somewhat constant over time. Our observation of U.S. fisheries management councils (comprised of federal, state and industry representatives), have indicated that frequent turnover in those attending decreases the productivity of the councils. Each new member must become familiar with the issues, projects, and processes. This requires time and hinders the functioning of the group.

Goals

While general goals have been stated in some cases, they do not appear to have been clearly defined in programatic terms. That is, specific targets have not been established. Using the goal of increased employment opportunities as an example, our reading of existing documents and interviews

with government personnel have not uncovered any guidelines as to the desired minimum number of new jobs to be created by fisheries development efforts. Neither do these sources provide a timeframe for the establishment of these new jobs, nor do they indicate the intended distribution geographically or sectorally (i.e., industrial or artisanal).

The establishment of such specific goals does not guarantee that they will be achieved. However, such targets can assist in evaluating programs, provide a measuring device against which actual progress can be calculated, and, finally, contribute to a better understanding by the public of what should be anticipated by fisheries development efforts.

Because Colombia is in the early stages of formulating a general Master Plan for marine resources development, it is understandable that more detailed fisheries objectives have not yet been established. However, specific goals should be defined before any full-scale development efforts are initiated for the fishing industry or any other industry in the marine sector. To facilitate the setting of more concrete development objectives, the entity charged with the actual drafting of the Plan Maestro may wish to consider directing relevant agencies to prepare, as a next step towards development, operational goals for their general development objectives.

An important aspect of the question of setting specific goals relates to funding. How and where will Colombian government monies be spent? It is assumed that the funds will be somewhat limited. Therefore, funds might be targeted for those areas where they would produce the most equitable distribution of benefits. If a limited fund is diluted through the application to many projects or fisheries, it is conceivable that the impacts will be minimal or even inconsequential. A major question, then, is how to set priorities for various fisheries either between species or between user groups (e.g., artisanal or industrial). One criterion might be the matching of specific projects/fisheries with likely sources of funding. Then government monies could be directed towards those projects/fisheries unlikely to get funding from other sources. For example, it appears that some assistance for fisheries development on the Pacific coast may come from the Japanese government. This assistance will focus on tuna and thus primarily

benefit industrial fishermen. To balance fisheries development between sectors, the Colombian government could then direct its attention in future fisheries projects on the Pacific coast towards those which would be of value to artisanal fishermen.

Development strategy

INDERENA is now pursuing a policy whereby each fishery targeted for development will be developed according to a different strategy. That is, some will be designed to generate foreign exchange credits, while others will be designated as providers of fisheries products for the domestic market. This can be viewed as a mixed strategy. On the whole, this is probably a good approach. It allows Colombia to take advantage of well-defined fishery stocks for specific goals and could also contribute to low levels of conflicts between user groups (that is, industrial and artisanal fishermen) by indicating which user group would be given priority or exclusive rights to a fishery.

However, a mixed strategy such as this could have distributional effects that run counter to the asserted goals of fisheries development, i.e., a general improvement in living conditions for all fishermen. For example, the great majority of ocean fishermen are artisanal, but it is unclear how they would benefit from the mixed strategy approach. Foreign exchange fisheries, which are the most valuable, are currently planned to be highly industrialized, excluding the participation of artisanal fishermen. This would leave the artisanal fishermen as suppliers of domestic fisheries products. But even if artisanal fishermen are given primary exploitation rights and development opportunities for fish destined for domestic consumption, it is not evident that their economic position would be improved. The domestic market and market infrastructure would have to be increased or improved. As noted above, Colombia has a relatively low level of per capita consumption of fish. Therefore, providing more fish for domestic consumption will not automatically lead to greater consumption. Thus the government, in concert with private industry, should consider working toward the increased consumption and acceptability of fish products.

While there are ongoing efforts to initiate projects for the industrial

fisheries, the same could not be said of projects important to artisanal development such as market development. It seems that artisanal fisheries are being considered second to and apart from industrial fisheries development. An opposite view is that the plans for artisanal fisheries development should perhaps be integrated with those for industrial fisheries. Distributional aspects such as these should be kept in mind by those drafting the Master Plan.

Focusing on industrial fisheries, the current strategy appears to be one of reliance on joint ventures. Using the example of tuna, Colombia has joint ventures with companies from the United States, the Soviet Union and Japan. Colombia is also pursuing the possibility of joint ventures with companies from the Republic of Korea (NOAA, 1983). Joint ventures can be profitable for all concerned; however, they must be structured in a way that allows for mutual benefit. The benefits that can sometimes be associated with fisheries joint ventures are:

- generation of income for companies and fishermen of the host country;
- improved balance of payments;
- increased supply of domestic fish products;
- income redistribution either to groups or geographical regions;
- increased employment opportunities;
- generation of an independent industry (i.e., technologically self-sufficient);

rapid development of underutilized species.

(Meltzoff and LiPuma, 1983; Kaczynski, 1979; Kaczynski and LeVeil, 1981).

There are also pitfalls related to joint ventures. These warrant careful

consideration; they include factors such as the following:

- joint ventures may provide for products of little interest to the host country (e.g., based on a limited foreign market);
- they concentrate on the richest stocks, which also may be of high interest for local fleets;
- it can take several years for projected production levels to be attained;
- they may prevent the domestic development of fisheries for underutilized species;
- they can create hardships for small-scale fishermen by causing decreases in their landings;
- depending on harvest methods, low-value species taken as by-catch may be wasted;
- they can result in a net capital outflow of earnings;
- they can alter or threaten long-standing cultural traditions and social arrangements.

(Kaczynski and LeVeil, 1981; Meltzoff and LiPuma, 1983).

The drafters of the Colombian Master Plan need not turn to foreign sources to develop model joint venture agreements. There are two very good examples within the country, both of which have been used for marine resources development. ECOPETROL (the national oil company) appears to have enjoyed major successes with its system of joint ventures for oil and gas development with major transnational corporations, and the private fisheries company Vikingos has prospered largely as a result of joint ventures with individual fishermen from other countries. This is not to suggest that either of these two models should be adopted in a wholesale manner in future fisheries development efforts. Rather, it is suggested that the effectiveness of these

models be evaluated and/or representatives from these companies be consulted in the design of future fisheries joint ventures.

As mentioned above, the development strategies for some high value species, e.g., tuna, do not take into account world markets. If there is a glut on the world market for a specific species, such as tuna, some portion of available development funds should be directed towards other species, perhaps considered to be of lower value. This will enable Colombian fisheries development to proceed without being prone to the vagaries of the world price of and demand for a single species.

One final note on fisheries development plans. It seems that they are being prepared in isolation. The diagnosis of the industrial fishing segment was conducted without consideration for the artisanal segment. The same is true of the artisanal diagnosis; no consideration was given to the interface with industrial fishermen. While it is true that the two segments of the fishing industry target different species, it is also true that developments in one segment can and often will have impacts on the other. For example, it is possible that industrial fishermen, through development projects and technological innovations, could acquire the capacity to process the by-catch (i.e., white fish) of their shrimping efforts. If so, they might displace some artisanal fishermen from the domestic market. This is only one hypothetical example; others could be provided. The point is that to achieve the maximum return from fisheries resources, the management of the various segments should be integrated.

Not only should the Master Plan consider all aspects of fisheries, it should also consider fish in a larger perspective. Fisheries products are one part of the Colombian food system. Thus, it may be advisable to consider the production of fisheries products in the context of the Colombia's more general food policies.

The Diagnóstico de la Pesca Artesanal en Colombia (Botero and Lozano, 1983) addresses some of the concerns expressed by artisanal representatives and suggests that the development of artisanal fisheries will be part of the overall fisheries development strategy for Colombia. However, as mentioned

above there still appears to be little integration of the total fisheries development effort. The collateral development of industrial and artisanal fisheries is very important and should be considered in the Master Plan. Further, artisanal fisheries should be viewed as essential components of small maritime communities. Finally, different strategies are required, as is recognized by INDERENA, for industrial and artisanal fisheries. To those involved with fisheries these statements are obvious; however, this document is addressed to a wider audience, some of whom may not be aware of the importance and uniqueness of artisanal fisheries. With this in mind, excerpts from a recent World Bank report are presented:

Development planners [should] recognize that artisanal fishing covers many different roles and techniques and is normally a part-time activity. Rather than treat such versatility as unprofessional, rather than rationalize a seemingly chaotic or redundant fishery by reducing its participants to a few career producers working full-time with a few powerful techniques, fishery developers [should] acknowledge technological and occupational diversification as a rational hedge against uncertainty regarding the size, location and weather--contingent on the accessibility of marine stocks...Illustrating the policy implications...is a concluding recommendation against integrating a fishery "vertically" [improving catch technology, expanding shore facilities, adding value through processing, reorganizing markets] without also considering the benefits of "horizontal" integration [enabling low-income participants in a fishery to benefit from interaction with nonfishing groups and respond to opportunities for nonfishing employment] lest well-intentioned developers end up escalating the scale of failure of a fishery...In short, a combined sensitivity to marine resources and maritime communities [i.e., artisanal fishing communities] will prove most conducive to optimal fishery policies in developing countries (Emmerson, 1980: i-ii).

Again, CONALPES may be one avenue for remedying this structural problem. Artisanal fishermen are given equal representation within CONALPES. Through this group, they at least have formal access to the fisheries decision-making process. Including artisanal fishermen in CONALPES seems to be reducing their sense of isolation and in so doing, also enhancing the likelihood of the overall success of fishery development efforts. More frequent meetings of CONALPES would of course advance the pace at which the artisanal sector is brought into the process of fisheries development planning (Rodriguez, 1984).

International trade

The disturbing fact about the Colombian export-import imbalance in

fisheries products is that Colombia is importing fisheries products which could be provided from its own waters. While the stock assessment data are scanty and periodic, indications are that Colombia has the natural resources to offset at least some of the imports of fishery products. The major fishery product imports are fish oil, fish meal, canned tuna and sardines. To greater and lesser degrees, all of these could be provided from Colombian waters if Colombia were willing to make the investment in an import substitution program.

Any discussion of improving the Colombian trade imbalance in fisheries products must consider the Andean Pact agreements. Formally known as the Andean Group, the Andean Pact was established in 1969, and is comprised of Bolivia, Colombia, Ecuador, Peru and Venezuela. Created to foster the economic integration of member countries, the Andean Pact has functioned to dramatically reduce trade barriers (Banks, 1975). Because the fishing industries of Ecuador and Peru are able to produce the imported fisheries products at a lower price than the Colombian fishermen, and also because trade barriers such as tariffs that could artificially inflate prices no longer exist, Colombians buy the cheaper foreign product. Thus, part of the solution to decreasing the importation of fisheries products is to make the domestic product competitive with that of Colombia's neighbors.

Three alternatives come to mind. First and perhaps administratively easiest, would be to initiate trade barriers on fisheries products so that foreign products would more expensive than domestic products. Unfortunately, this would probably result in other Andean countries raising barriers against other categories of Colombian products which they import. This approach would require Colombia to decide that the gains to be made in fisheries import substitutions outweigh the lost exports in other sectors as well as the lost good will of its neighbors.

We understand that in Colombia there is currently some discussion of renegotiating a modification of the terms of the Andean Pact. While we would not presume to suggest what Colombia's foreign policy should be, we would like to point out that domestic fisheries production might be a major beneficiary of such a move.

A second alternative is for the Colombian government to provide incentives (e.g. tax breaks, special loans) to investors committing capital to fish-meal, fish oil, canning, etc., facilities. This would place the government in the position of subsidizing the industry. Depending on government policy, this too could be seen as undesirable. Once an industry becomes dependent on government subsidies, it often becomes difficult to extricate the government from the position of perpetually providing those subsidies.

Finally, a passive approach could be taken with the Colombian government taking no action. It might be that comparative advantage does not favor Colombian production of fishery products now imported. Or it might be decided that the costs involved would not balance the gains. (One should recall that the 1983 trade imbalance in fisheries products was approximately US \$83.9 million (Colombian Information Service, 1983)).

Funding for Fisheries Activities

For fishery development to take place, more public sector funds would have to be allocated for research (e.g., annual or biennial stock assessments, product acceptability, marketing strategies) and for additional management personnel. Initially, additional funds may also be required to provide an adequate pool of specialists in such topics as stock dynamics and fisheries management techniques. While current staffs are very competent, the expected expansion of effort would most likely exceed their capacity to fulfill all of the required tasks. These anticipated costs of accelerated fisheries development are not related to any specific project; rather, they represent the general costs that will inevitably accompany development with its attendant needs for greater planning, management and research. In terms of specific projects, the Master Plan should determine the nature (but not the specifics) of fisheries development projects and the sources of funding for each type of project.

The formulators of the Master Plan are cautioned against direct involvement with the specifics of fishery development projects. This would detract from their perspective on the overall development plan. The attention necessary for putting together feasible fisheries-specific plans will be very

great. The efforts of the Master Plan development team would be better spent on formulating the general parameters for marine resources development.

A funding question related to enforcement is the issue of research allocation. It seems that most, if not all, of the money now being spent is dedicated to biological research. While this is important, it should be realized that when fisheries are fully exploited, rigorous management regimes are required. Some of the research dollars should be diverted to consideration of management, regulatory, and enforcement options. This could include the training of fisheries management personnel in the techniques of fisheries management.

In terms of the private sector, Colombian development of its ocean fisheries resources will be contingent upon significant financial resources being made available for investment. Even the exploitation of some currently successful fisheries, notably shallow-water shrimp, suffers from a lack of capital (Vikingos, 1983). This may well be the major obstacle for the development of Colombian fisheries. An ambitious fisheries development effort will require many components, such as new vessels and port facilities, new processing/freezing facilities, improved distribution networks, and more aggressive marketing strategies. All of these are very costly and can very quickly add up to very large capital requirements. Yet it is almost impossible to leave out any of the components in order to cut down on total investment requirements. A new boat without a place to land its catch is useless; a warehouse of canned tuna is without value if it cannot reach markets.

A major obstacle in financing the development of Colombian fisheries is the current financial environment of fisheries. As elaborated in the "Propuesta a la Comisión Nacional de Pesca para la Reestructuración Financiera del Sector Pesquero," the structure and risks associated with the fishing industry are such that private investment is inhibited. These are well documented elsewhere (see for example DNP, 1980 and Botero and Lozano, 1983, "Diagnostico de la...") hence only a few of the indicative points are listed. There is no guarantee that fish stocks will be available. Random environmental fluctuations can cause species to change their migration

patterns. Market prices for harvested fish are not certain. Decreases in demand and/or increased availability may create prices lower than expected. Inclement weather can prevent fishing activity. A fishing vessel, either because of storms or mechanical problems, can be lost at sea.

The government might therefore consider the establishment of guarantees or incentives which would lure private investors to the industry. There are several ways in which this could be achieved. Some of those used in other countries (such as Canada and the United States) are listed:

- The government can guarantee any loan made to a qualified fisherman by a private investor. If the fisherman defaults, the government pays off the loan.
- The government can make loans directly, or through an intermediary (e.g., a bank) to qualified fishermen.
- The government can allow the establishment of accounts for fishing profits. Any funds deposited in such accounts are then tax exempt. This allows fishermen to develop capital more rapidly.
- The government can purchase or otherwise acquire vessels which can then be leased to fishermen who would then have the option of buying the vessel.

All of these require some form of government subsidy. As cautioned above, any government should consider the type of subsidy it is willing to support, at what level, and for what duration.

Of course another option exists, and that is for the government to directly operate fishing fleets, as is done in nations such as the Soviet Union or Poland. But this defeats the purpose of attracting private capital to this sector.

The Colombian government could also be instrumental in fostering a better atmosphere for investment by changing the rules for allowable collateral. Currently, neither vessels nor catch can be offered as collateral, deterring some investors. In some countries, as stated above, the government guarantees loans to qualified captains/owners for the purchase or improvement of fishing vessels. This is being proposed by the "Grupo de Trabajo Sobre Crédito Pesquero" and should be seriously considered.

Finally, Colombia is a nation which looks inward. National attention is directed towards the cities and agricultural resources in non-coastal areas. Investors share this outlook. Some effort, such as special seminars for potential investors, should be undertaken to raise awareness of the investment opportunities presented by ocean resources. A belief in the reality of ocean resources development could lead private investors to seriously consider ocean resources as viable investment opportunities.

Potential

The potential for fisheries development may not be as large or as small as indicated by the stock assessments of the last decade. With a limited number of assessments it is difficult to judge the accuracy and dependability of those assessments. First, each of the assessments which have occurred have been of the single-point variety. Each has taken a window in time and tested the abundance of fish stocks at that point. From these non-longitudinal assessments, estimates about yield have been made. This problem is explicitly recognized in the most recent stock assessment conducted for Colombia by Japan. The Japanese caution that due to the many gear types used, the large areas covered and the short time involved, the data and conclusions of the study must be considered "superficial" (JICA, 1981:507). What is brought into question here is whether the stock levels indicated reflect peaks or valleys in the natural fluctuations of fish stocks. If so, any development plan designed to take advantage of an unduly high projection of potential could lead to an overcapitalized fishery. Conversely, a plan based on low estimates could result in the continued underutilization of fisheries resources.

Second, some of the data which indicates an opportunity for expansion of Colombian fisheries is for fisheries which are either not now being exploited or are being exploited at only very low levels (e.g., deep-water shrimp). The caveat here is that it is not necessarily safe to assume that the sustainable yields will be as high as predicted once fishing pressure is applied or increased. Fishing mortality could lower recruitment rates, thereby lowering the harvestable biomass.

It should be noted that the fisheries division of INDERENA is well aware of the problems associated with the existing stock assessments (Mora, 1983).

They are reiterated here in order that those not intimately aware of the problems inherent in projections about the potential of fisheries will be able to appreciate any hesitancy on the part of INDERENA either to support or discourage development of fisheries at levels indicated by the presently available data.

An example of an appropriate data system can be provided by the case of the U.S. National Marine Fisheries Service. This agency has developed a system for the collection of fisheries data, which includes landing reports, marketing data, and periodic surveys by research vessels. While far from perfect, the system does enable fisheries managers to make projections concerning the future availability of all commercial species. It should be noted that this system has evolved over time, and a similar period of maturation should be expected for any system developed in Colombia.

A third concern about fisheries potential is that prior to any investment in that potential, markets for the product(s) should be identified. Two examples are illustrative of this problem: 1) tuna has been identified as a fisheries resource which could be exploited. But where will it be sold, and at what prices? The last few years have witnessed a glut on the world tuna market. In part this is due to a decrease in the demand for tuna in the United States. This glut can also, in part, be attributed to the discovery and development of a major tuna resource in the western Pacific--much of this tuna is destined for the U.S., Japan and other countries in east Asia. Also, other suppliers of tuna in the eastern Pacific, such as Ecuador and Mexico, have increased their production (Lanier, 1982). As a recent report advises:

In the longer term, the tremendous tuna fleet expansion in Mexico, and the more moderate recent and planned expansions in Australia, Indonesia, France and other countries points to a glut on the world tuna market that will not be short-lived...For those contemplating investment in tuna vessels and production facilities, the watchword for the foreseeable future should be: caution (Lanier, 1982: 13, emphasis added).

2) Shrimp is another resource with potential for development as an export fishery. Unlike tuna, there is currently a strong international market for shrimp even though there has been a 56% increase in landings in the past decade (Rackowe, et al., 1983). Projections are that imports of shrimp to the major markets will increase by 1990. Annual growth rates in shrimp imports of

1% are anticipated for Japan and the United States until 1990. This equates with a requirement for 18,000 additional tons for Japan and 16,900 for the United States. Western Europe, the other major market for frozen shrimp, is expected to have an annual growth rate of 5% and require an additional 20,300 metric tons by 1990 (Rackowe, et al., 1983).

Again, however, caution should be exercised in development planning. There are other shrimp resources in the world which are not now fully exploited (e.g., Mexican shrimp fisheries in the Gulf of Mexico). Elsewhere, for example in Brazil, major efforts are being made to increase production of shrimp (Anonymous, 1983). Also, it is expected that aquaculture will provide much of the increased demand for shrimp (Rackowe et al., 1983). If and when these additional world supplies of shrimp come on line, they could depress prices on the world market and thereby harm Colombia's overall fisheries development plans.

A final point on markets is required. A great deal of the fish harvested in Colombia is for domestic consumption, particularly those harvested by artisanal fishermen. Expansion and development of all segments of the fishing sector will therefore necessitate larger domestic markets. This may require more than making fisheries products readily available. Of the more than 20 countries in Latin America, only five have lower per capita fishery product consumption rates than Colombia (NMFS, 1981:92). The demand for fisheries products is largely determined by cultural patterns. It may be that the low per capita consumption of fish in Colombia is rooted in tradition rather than in product availability. If this is true, then the Master Plan should also include provisions for the study of the acceptability of fish products and ways of increasing public acceptability. One possible route to fish product acceptability is the regular inclusion of fish in the meals provided by schools. This educates the children about fish and in time creates generations of fish consumers (FAO, 1982). This could be one part of a larger national program of media advertising to generally increase the consumption of fisheries products in Colombian homes and restaurants. Because fish consumption is linked to consumer education, it is important that any national program should keep information before the public.

Lectures and demonstrations before school and university groups, TV presentations, work with food editors [of newspapers and magazines] and the food trade press, participation in cooking schools, work with industry trade associations and firms on consumer education programs are seen as logical functions....Particular emphasis [should be given] by industry to the need for consumer education to counteract unfavorable and misleading information concerning contamination of seafoods. Also important is the need for working with medical and other health-oriented groups to provide factual information on the values of seafood in low-cholesterol diets and other nutritional-health attributes of seafoods.

[It should be remembered that consumer] education is visualized as desirable as a means of maintaining and expanding the use of all species of finfish and shellfish in all forms -- fresh, frozen and canned. Identification and evaluation of markets and market characteristics, nutritional evaluation of products, development of new uses or ways of serving, recipes and cooking procedures are all seen as necessary elements of a consumer education program. (Development Planning and Research Associates, Inc., 1972: II-9.)

Another major consideration for Colombia in its development of fishery potential will be the industrial infrastructure. It will not be enough for Colombia to bring more fish ashore if a bottleneck exists at the docks. In deciding on the future direction of fisheries development, the Master Plan should consider what will happen to the fish once they are unloaded from the vessels. While infrastructure problems are clearly recognized by INDERENA, it will require a national effort to address these problems--thus, the suggestion that the drafters of the Master Plan be cognizant of them. A few such problems are presented as examples. Refrigeration facilities must be available for many fish products. An inadequate distribution network could derail efforts that result in increased production. Similarly, if Colombia is to substitute its own fish meal for that which is now imported, it will require additional processing facilities. Planning for these eventualities does not appear to be present.

Finally, if the development of fisheries potential in Colombia is to be tied to a policy of import substitution, then something must be done about the comparative disadvantage created for Colombian fisheries as a result of the Andean Pact. As discussed earlier, those species which could be used for fish meal, fish oil or other industrial fisheries products will remain underutilized, at least for the Colombian market, if this problem is not resolved.

Enforcement

The problem of enforcing regulation warrants some attention. In Colombia, enforcement activities for fisheries regulations are the responsibility of DIMAR. Yet it is INDERENA which promulgates the regulations. Thus, the effective enforcement of fisheries regulations requires cooperation between the two agencies so that each can fulfill its responsibilities. A formal consultative mechanism might be one solution to the need for communication between the two agencies. If such a consultative mechanism were established, INDERENA could inform DIMAR of new regulations in a timely manner. Conversely, DIMAR could make INDERENA aware of regulations which were difficult to enforce. By cooperating, the two agencies could develop a set of fisheries regulations which were both effective and enforceable.

Although this may appear to be a minor matter, those responsible for the formulation of the Master Plan should give some thought to the issue. As Colombia moves toward fuller utilization of its fisheries resources, enforcement could well become a pressing matter. Thus, having a regulatory enforcement scheme in place prior to the time it is actually needed will be beneficial and will enable Colombia to respond rapidly to violations by either foreign or domestic fishermen.

The enforcement of foreign fishing exclusions could become a larger and more significant problem in the relatively near future. In the past, illegal fishing by foreign vessels has primarily caused immediate, short-term losses to Colombia. In effect, foreign fishermen have deprived Colombia of the economic value of the fish taken. As Colombia moves towards more complete utilization of its fishery resources, however, illegal foreign fishing (because this effort would not be included in fisheries management decisions) could pressure stocks beyond maximum sustainable yield, thus causing stock collapse. If this were to occur, Colombia would experience continuing long-term losses.

In terms of the use of dynamite by artisanal fishermen, some thought should be given to whether the ban on this method is justified, and to methods of insuring compliance by artisanal fishermen. Education on the environmental

problems and the safety hazards involved with the use of explosives for fish harvest may prove more effective than direct enforcement efforts.

Another option is the establishment of a "foreign observer" program. Colombia may wish to consider the placement of Colombian observers on all foreign vessels legally operating in the Colombian EEZ. The observers could monitor the fishing activity of the foreigners as well as collect valuable scientific information. The cost of this program could be paid for by the foreign fishermen as part of their obligation for gaining access to Colombian waters.

F. Concluding Remarks

Given these considerations about potential, what then is the appropriate strategy for development? We would suggest that development plans not be based on the few existing assessments, which may under- or overestimate the maximum sustainable yield of fish. If this were done, two negative results could occur. One, in the case of overestimation, investments in projects or infrastructure development might occur for fisheries that are not sufficiently abundant. Second, in the case of underestimation, the capacity to take full advantage of a fish stock may not be developed. Rather, development should be phased in. This would allow Colombia to begin to collect longitudinal data on the actual long-term availability of fish, as well as to determine the effect of fishing mortality on stock recruitment.

An incremental approach to fisheries development would permit Colombia to base future decisions on the successes and failures of its own experience. Investment can thus be made according to growing knowledge of the resource. To facilitate this, projects should be designed so that they can easily be expanded. Further, a many staged development plan would provide built in opportunities for Colombia to assess the effects of various development projects as well as to monitor the vagaries of the international fish market. Also, a phased approach would permit the Colombian fishing industry to demonstrate its viability. In so doing, it is likely that Colombian investors would become more interested in the fisheries sector than they are now. Finally, a phased approach to fisheries development would ease the financial

burden for Colombia. The country would not have to provide all of the required capital for total fisheries development at one time. Rather, the financial requirements would be staggered over time as the various phases of fisheries development occurred.

Before turning to aquaculture, a final comment of marine fisheries is required by recent events. As the final draft of this report was being prepared, information was received (Bolaños, 1984) on fisheries programs/policies now being reviewed for possible adoption by the Colombian government. Although full details are not available it appears that among items now being considered are: 1) a national fund for fisheries development; 2) creation of a special office to facilitate the financing of fisheries projects; 3) establishment of an agency to conduct stock assessments and marketing studies; 4) provision of fiscal incentives to make Colombian fishery products competitive with those of neighboring Andean Pact members; and 5) formation of a national cooperative to assist in the development of artisanal fisheries.

Even though we do not have full knowledge of these proposals, they seem to be clearly in line with many of the observations made above. Therefore, it is urged that the drafters of the Plan Maestro contemplate adding their support to the measures.

II. AQUACULTURE: ISSUES AND PROSPECTS

A. Introduction

Colombian maritime aquaculture is in its infancy. It will be several years, perhaps a decade or more, before the industry could become commercial and/or profitable. Therefore, aquaculture is and should be treated as a research area. However, there is the possibility for aquaculture to become a profitable industry in Colombia. Many of the impediments to expansion are the same as those in Ecuador and Costa Rica. These are given in detail below. We then provide a hypothetical guide to aquaculture development in the following section and discuss some of the issues and problems associated with or

encountered in the process of creating an aquaculture industry in other developing countries.

B. Examples from Ecuador and Costa Rica

Ecuador

Shrimp farming became a focus of international development in the mid-1970s. Large areas of coastal lowlands in southern Ecuador were considered suitable for farm locations. In those areas, land not flooded with high tides was privately owned; the flooded areas and mangrove swamps were under control of the Navy. The shrimp farms ranged from 20 to 500 hectares, and were built in areas where the soils had such high salt residues that the land was not appropriate for agriculture. Since that time additional ponds have been built in Guayas, Manabi and Esmeraldas provinces.

Most pond production comes from two species of white shrimp: P. stylirostris and P. vannamei. Postlarval and juvenile shrimp are stocked, having been collected by hand, trapped in nursery ponds or pumped into the pond with the incoming tide. Collection is a source of employment for many individuals on a seasonal basis. There are few nutrients added to the ponds; most depend upon the fertile coastal waters to provide food. It takes 7 months to reach 30 count shrimp--30 tails to the pound. Harvested shrimp are packed on ice and trucked to cities to be frozen for export. Yields vary greatly--estimates range from 300 to 1500 pounds of shrimp (heads-off) per hectare. There have been suggestions that, rather than the capture of postlarval or juvenile shrimp, the aquaculture industry should consider shrimp hatcheries because they would then be able to experiment with new varieties of shrimp which would grow more rapidly, possibly reduce costs, and improve survival since many of the shrimp caught in the wild die from injuries associated with their capture. However, most shrimp farms depend upon wild capture for their product (Neal, 1976).

By the end of 1980, Ecuador had approximately 30,000 hectares of shrimp ponds, and they estimated 40,000 by 1981 and 60,000 hectares by 1982. Estimates of harvest in 1980 were 12,500 t live weight. The potential for aquaculture appears great because the warm climate allows pond operators to

harvest two or three crops annually. Also, large tidal ranges act as flushing mechanisms that remove wastes and return nutrients to the system (NOAA, Division of Foreign Fisheries Analysis, 1981).

Shrimp farms range in size from 50 to 500 hectares, and their construction in the coastal zone is regulated by the government. However, until recently alteration of mangrove to pond was not strictly controlled. Ponds are worked by approximately 40,000 Ecuadoreans, mostly farm laborers. Many shrimp farms are in isolated areas and operating expenses are high because of the cost of transporting material and equipment to the farms and transporting the product to market. The shrimp are sold to one of the 20 shrimp packers, many of whom are also pond owners (NOAA, 1981).

Expansion of aquaculture in Ecuador depends upon a) finding a reliable source of post larval shrimp, b) developing a source of brine shrimp (*Artemia*) to feed larvae and postlarvae, c) improving the number of aquaculture specialists in country, d) the ability of companies to finance expansion in light of variability in international shrimp prices, e) the government's regulation of fuel prices which will influence operating costs for those ponds which need to pump water rather than depend upon the tides (NOAA 1981).

Costa Rica

There have been several aquaculture development projects in Costa Rica in the last two decades. These have focused on shrimp, and have developed under the auspices of the federal government, international agencies, development agencies, and private industry. Early estimates for coastal shrimp farms were that 2000 acre ponds would produce about 6 million pounds of shrimp; they hoped for production of 4000 pounds per acre but these hopes and expectations have not been met. The aquaculture system depended upon existing trawlers catching gravid females which would be introduced to a hatchery. The post-larval shrimp would go through several grow-out ponds, taking 4 to 5 months to get the shrimp to salable size.

It would appear that aquaculture in Colombia may have many of the problems experienced in Ecuador and Costa Rica: lack of expertise within the country, lack of stable supplies of postlarvae, lack of familiarity with pond systems,

expenses related to ponds in less-than-ideal locations, financing and marketing. These problems can be addressed by regional and national planning, seeking advice from international development agencies, and careful consideration of the trade-offs between pond culture and capture fisheries. The following paragraphs suggest a range of information Colombian aquaculture planners should consider in the process of aquaculture development.

C. Aquaculture--Theoretical Considerations

Aquaculture may improve the nutritional well-being of the population, increase local income levels and improve standards of living--better food, medicine, education and housing--and increase the volume and value of exportable products. There are as many variations in techniques for fish farming as there are for growing other crops. Each fish farmer must decide on a crop appropriate to his region, land, and market, and then prepare the pond, procure seed, introduce fish, add nutrients, harvest, process, and sell or distribute the crop. Fish farmers are constrained by seasonal changes, weather, disease, predation, and the lack of materials, capital, parts for machines, trained labor, or management experience. They also may be affected by other local food-producing sectors, such as agriculture and capture fisheries. Local, regional, or national governments may be responsible for constraints in the form of laws, lack of educational training facilities, inefficient capital flow, poor transportation facilities, or inadequate marketing systems. Finally, existing customs, political organization and traditions for land and water use may inhibit successful production from aquaculture.

There are strong arguments for the culture of native species. Markets for the products already exist, as do approved methods for handling and transporting the fish. Local scientists are likely to be familiar with their feeding characteristics and growing conditions. The problem of introducing species that may become pests in the natural environment should be avoided. If the cultured products do not have distinct advantages over those from the wild, such as superior quality or availability over a longer season, competition with harvest from the wild may keep selling prices too low to cover a project's expenses. The choice of a species similar to native species

may allow aquaculture to take advantage of existing markets and improve efficiency too. Cultivated varieties of native species may have faster growth rates or may be disease resistant. A cultivated species that is similar to native species may be particularly desirable for government projects intended as demonstrations of aquaculture potential. If, however, a project is being run on a strictly profit-making basis, a species intended for a high-priced, specialized market (e.g., shrimp export) would be the best choice, and this may or may not be an introduced species.

An individual, family, cooperative, or large business may operate a fish farm, using an artificial environment--a newly dug pond, an irrigation system adapted to aquaculture, a concrete tank--or a natural one such as an existing pond, bay, or protected waterway. A freshwater system may require adapting land use from agriculture or irrigation.

Aquaculture production requires a source of broodstock or seed, nutrients, good water quality, and the means of controlling predators and disease. In addition to raw materials, engineering and biological knowledge are necessary to design and operate such systems.

Brackish and saltwater aquaculture will not necessarily disrupt or displace agriculture but may affect traditional fishing, seaweed harvesting, or other uses of bays, estuaries, mangrove swamps, or shallow-water areas. Floating cages, raft systems, elaborate net enclosures, and other structures may be used to keep fish or shellfish within the control of the farmer but may demand accommodation by other users of the area, who may be accustomed to unregulated harvesting or unrestricted passage. These other users would include artisanal fishermen, commercial fishermen and recreational boaters.

Although fish provides calories, it is usually expensive compared to other caloric sources, so its major importance is likely to be as a source of high-quality protein. In planning for aquaculture development, we must ask first whether the local population needs additional sources of protein. If so, is aquaculture the best way to provide this? Is the need for protein distributed throughout the population, or is it specific to groups, such as children or nursing mothers, or to certain geographical areas? Another issue

is whether the type of fish or shellfish protein provided by aquaculture is acceptable to local palates. Food taboos against some kinds of fish or shellfish must be considered. If the product is intended for export, can it compete in the world market--with the shrimp being produced by the Japanese or the trout being produced by Australian and New Zealand systems?

Aquaculture may compete with other production systems in the economy. Supplies of labor, space, capital equipment, and financing can be drawn from a common pool. Competition for facilities is likely to be most severe at the local and regional level, although production destined for a distant urban or export market may encounter critical shortage or congestion in other parts of the economic system. Even without conflict with capture fisheries over use of lakes or brackish water inlets, in situations where the aquaculture system is based upon the capture of juveniles from the wild to be raised to maturity in controlled conditions, there is the likelihood that aquaculturalists will be blamed for any fluctuations in the wild population. Conflicting ownership claims are likely to arise if the aquaculture activities add value to what was formerly common property. In the marketplace, fish from culture systems are in direct competition with those harvested from the wild, and in less direct competition with other foods, particularly those high in protein. Since transportation and marketing systems are generally used by producers of all food items, as well as by other production sectors of the economy, conflicts can and do arise here.

In regions with high levels of unemployment, a labor-intensive technology for fish production might be selected despite the fact that it is not the most efficient from a business standpoint. There may be obligations to employ an adult from each household or kin group in order to distribute the benefits within the community and ensure community cooperation. However, if some sectors of the population suffer from protein shortages, a technology that produces the largest volume of fish in the shortest period of time may be selected, with other means developed to address the employment problems. In some countries, labor may be so abundant that the marginal productivity of labor in agriculture or fishing is near zero; taking some workers from traditional activities to work on aquaculture may not decrease productivity in the rest of the local economy. In other situations, the amount produced by labor in the new aquaculture project must be assessed in terms of loss of

productivity from other work.

Aquaculture projects may be designed to provide profits to either a private owner or to the community at large. Local people may receive little or no benefit from a profitable project unless taxes collected from the enterprise are used within the community for projects such as improved schools. But even if accomplished, this circuitous return may not be perceived by the local residents as a consequence of aquaculture. If the project were owned by the municipality, there could be improved services for local residents in the same way that an enterprise owned by a cooperative or association benefits members of the cooperative.

When private enterprise is fostered in regions where the distribution of capital is unequal, a fish farm can result in increased social stratification. In many cases, development projects such as this are restricted to residents who can afford an initial investment, so the only individuals who can take advantage of the new opportunity are those who are already well-off. Methods of extending credit to the needy should be investigated.

In some areas, farmers may be unwilling to deal with fish, while a traditional fisherman may feel that aquaculture is a form of farming and that engaging in it would damage his self-esteem. Another potential labor problem is that high paying managerial jobs may be filled by imported labor, causing local resentment and possible economic conflict. If the types of jobs required by the aquaculture project are not attractive to the local population, labor may have to be imported to fill even low-skilled jobs. An influx of labor is likely to create local social and economic changes, some certain to be disruptive.

Aquaculture products destined for sale near the production site can be sold fresh whole or may be gutted, gilled or headed before sale. Those intended for shipment should be chilled on ice, frozen, salted, smoked or dried. The processing technique need not be elaborate; in many places processing is done by women, old men, or adolescent children, with minimal capital equipment. For new products, special marketing studies or promotion

campaigns may be needed. There are problems with some preservation systems. Ice may not be available in remote areas; the local weather may be too humid to ensure a top quality dried or smoked product; frozen fish may be less desirable than fresh fish. Modern freezing equipment designed to produce a product that maintains many of the qualities of fresh fish may not be available, may be too expensive, or may be difficult to maintain.

Where regional government is responsible for the maintenance of roads and communication systems, extension services, hatcheries, and other facilities, aquaculture development is promising; lack of these facilities should cause developers to consider the probability for success. National governments determine the formal structure of laws and regulations, and national development plans are vital for encouraging or discouraging aquaculture relative to other activities. Other policies--such as differential exchange rates, provision of credit facilities, education systems, participation in regional trade groups or activities sponsored by international agencies, and the economic and technological infrastructure--are important considerations in development planning.

D. Concluding Remarks

Aquaculture can produce benefits more widespread than the provision of food. For example, an enterprise established with careful attention to marketing may develop new roads or communication lines to distribute the product; the same roads also would serve many other purposes. A processing facility developed in association with aquaculture could provide the means for processing other fish from open ocean or freshwater fishing. Credit systems designed for the aquaculture may be expanded to include other development projects in the region and could lead to regional economic improvement. Electric lines installed to run pumping equipment also could serve many other purposes in the community. Other indirect benefits may be the development of trained labor and improved markets for fresh fish and other products. Indirect effects of an aquaculture enterprise are likely to be different in each situation. Careful assessment of the local economy would indicate the most likely benefits and how the beneficial effects could be improved.

The circumstances and perceived needs that lead to the development of aquaculture may change over time. An aquaculture project may be a temporary solution to local problems, but may not be viable over the long run. Viability depends not only on economic profitability but also on the role the project plays in the community. Customs and traditional power structures are likely to be more important than written laws in determining how an aquaculture enterprise operates. Customs ranging from socially accepted pilfering to traditional labor roles for segments of the community will influence the organization and operation of any project.

3. Concluding Remarks

Aquaculture can produce benefits more widespread than the provision of food. For example, an enterprise established with careful attention to marketing and development and with or without government lines to distribute the product; the same could also serve many other purposes. A processing facility developed in association with aquaculture could provide the means for processing other fish from open ocean or freshwater fishing. Credit systems designed for the aquaculture may be expanded to include other development projects in the region and could lead to regional economic improvement. Electric lines installed to run pumping equipment also could serve many other purposes in the community. Other indirect benefits may be the development of trained labor and improved markets for fish and other products. Indirect effects of an aquaculture enterprise are likely to be different in each situation. Careful assessment of the local economy would indicate the most likely benefits and how the beneficial effects could be improved.

CHAPTER 3

OCEAN ENERGY AND MINERALS

James M. Broadus

This chapter is an attempt to diagnose the actual situation of marine minerals and energy in Colombia. Offshore oil and gas are treated here as both marine minerals and energy. Other ocean energy possibilities are examined only briefly because of their very limited current prospects. With the important exception of offshore oil and gas, and the more limited exception of marine salt resources, it is concluded that the potential contribution of marine minerals to Colombia's economy is remote and largely speculative at this time. The government's current approach of continued study and measured investigation seems appropriate in this context. This is consistent with the recommendation of the National Development Plan, which states that "mining policy should be directed first toward eliminating one of the basic limitations, which is the lack of knowledge concerning potential in terms of resources and their location" (DNP, 1982).

A. Introduction

Although Colombia has long been the world's leading producer of high-quality emeralds and leads Latin America in coal and gold production, the minerals sector historically has contributed relatively little to Colombia's overall economic prosperity. Currently, the minerals industry accounts for about 1% of the gross domestic product. As can be seen from Table 3.1, the mineral sector's contribution has been small in Colombia over the past quarter century and is now near the low point of a gradual downward trend. Over the same period, the contribution of minerals output in neighboring economies has: increased from just over 1% to nearly 7% in Ecuador (mainly from oil output at OPEC prices); fluctuated steadily about 7-8% in Peru; declined dramatically from over 25% to less than 10% in Venezuela (chiefly as a result of strong growth in other sectors); and remained persistently negligible in Panama. Employment in Colombia's mineral sector is not well documented but has been

TABLE 3.1

PAST CONTRIBUTIONS OF GROSS INTERNAL MINING PRODUCTION
TO THE GROSS DOMESTIC PRODUCT ACCORDING TO COUNTRY IN LATIN AMERICA*

COUNTRY	Colombia	Ecuador	Panama	Peru	Venezuela
1950	2.5	1.2	0.3	7.0	22.7
1960	2.7	1.3	0.3	7.9	27.5
1961	2.4	1.2	0.2	8.0	26.3
1962	2.2	1.2	0.3	7.1	26.2
1963	2.4	1.3	0.3	7.2	24.6
1964	2.5	1.2	0.3	7.1	23.8
1965	2.6	1.1	0.3	6.8	23.1
1966	2.4	1.0	0.3	7.0	21.9
1967	2.3	1.0	0.3	6.9	22.0
1968	2.1	0.9	0.3	7.3	21.2
1969	2.3	0.9	0.3	7.0	20.3
1970	2.1	1.0	0.2		19.9
1971	2.0	1.1	0.3		18.0
1972	1.7	4.0	0.3		16.2
1973	1.8	9.8	0.3		16.3
1974	1.5	7.8	0.3		13.6
1975	1.4	6.9	0.3		10.4
1976	1.3	7.2	0.3		9.3
1977	1.0	6.3	0.3		8.3
1978	1.1	6.6	0.2		7.6
1979	1.0	6.6	0.2		8.0

*Including hydrocarbons

SOURCE: Cepal; E/Cepal/1081 via Ministerio de Minas y Energia, ECOMINAS,
Mineria en America Latina/CIFRAS Nov.-Dec., 1982

estimated at between 50-70 thousand, or about 1% of the employed workforce. It is one of the smallest employers and has declined as such in the past 25 years (see Table 3.2). In 1979, mineral exports were valued at \$318 million, or about 9% of the total value of exports (Martino, 1981). Within a few years, with full-scale production from the large Cerro Matoso nickel and the El Cerrejon coal projects, the economic contribution of the mineral sector should more than double (Billiton, 1980; ECOMINAS, June, 1982; and Martino, 1981). Coal will probably rank as Colombia's second most valuable export commodity. Even then, however, the entire minerals sector would represent less than 4% of current gross domestic product, although making a proportionately greater contribution to Colombia's balance of trade. The contribution of marine minerals to the minerals sector is negligible, with only some offshore gas and marine salt currently in production.

As recently as twenty years ago, most geologists and minerals policy makers thought of the ocean floor as more or less uniformly inaccessible and mineralogically barren, consisting largely of basement basalts protected from the aging and weathering processes that created many important onshore mineral deposits. Recent experience with the growth of offshore oil and gas production, extensive exploration and research and development (R&D) for manganese nodules, and the actual profitable production of a number of minerals from continental shelf deposits has changed this view dramatically. The oceans are now recognized as a possible source of huge amounts of important supplies.

Since 1978, Colombia has exercised jurisdiction over nearly 1 million km² of Exclusive Economic Zone (EEZ) in its adjacent oceans, with 320,000 km² in the Pacific and nearly 680,000 km² in the Caribbean. In these vast tracts of sea bottom, deposits of useful minerals are almost certain to exist. As INGEOMINAS notes in its March, 1983, "Estudio del Margen Continental Colombiano Atlántico y Pacífico:"

Within this extensive zone, Colombia hopes to find a wide variety of minerals associated with the marine environment. Concerning the exploitation of mineral deposits on the continent, it is thought that a shortage may occur in the future; as our country continues to develop, the consumption of minerals on land will increase.

TABLE 3.2

ECONOMICALLY ACTIVE POPULATION ACCORDING TO ECONOMIC SECTOR

(Thousands of People and Percent)

ECONOMIC SECTOR	1951*		1964*		1978**	
	POPULATION	%	POPULATION	%	POPULATION	%
AGRICULTURE	2,023.3	53.9	2,437.1	47.3	2,746.5	34.2
MINING	61.2	1.6	81.3	1.6	68.2	0.9
INDUSTRY	460.9	12.3	656.0	12.8	1,415.2	17.6
ELECTRICITY, WATER & GAS	10.5	0.3	13.3	0.3	29.8	0.4
CONSTRUCTION	132.9	3.5	220.7	4.3	371.8	4.6
COMMERCE & FINANCE	203.8	5.4	440.5	8.6	1,488.2	18.6
TRANSPORTATION & COMMUNICATIONS	130.1	3.5	191.8	3.7	353.7	4.4
SERVICES	598.1	15.9	925.9	18.0	1,526.3	19.0
OTHER ACTIVITIES	134.8	3.6	177.5	3.4	0.0	0.0
NO INFORMATION	0.0	0.0	0.0	0.0	22.6	0.3
TOTAL	3,755.6	100	5,144.1	100	8,022.3	100

*Statistics include people twelve years of age and up.

**Refers to the employed population.

SOURCE: DANE Censos de Poblacion, Encuesta Nacional de Hogares, Etapa 19 (1978) via ECOMINAS, Agosto, 1981

Obviously, it is recognized that the economic potential of marine minerals and ocean energy for Colombia is long-run in nature, depending on the course of future developments and the growth of knowledge about the potential resource. For an economy pressed on many sides by immediate problems of human necessity and scarce financial resources, the question is how best to investigate and promote the potential of marine minerals and energy without excessively diverting the nation's precious capabilities and human energies from the most productive purposes.

To begin to answer this question, it is useful to examine Colombia's offshore mineral and energy potential with regard to both the comparative situation, on an international and regional basis, and the relative potential of various minerals. It is also useful to make hypotheses about the implications of the situation for Colombia's marine minerals and energy development strategy and to identify the most obvious problems likely to be encountered in pursuing that strategy. On the basis of the available information, several observations are offered here.

B. Colombia's Offshore Minerals in Perspective

As noted above, even if offshore minerals were to represent a major portion of the current minerals sector in Colombia, they would still contribute relatively little to the total economy. Furthermore, not only are minerals a small contributor to Colombia's total production, but except for oil and gas, marine minerals are of miniscule importance to global minerals production (Germinal, 1983; Ross, 1981; Ross, 1980; Earney, 1980; Cronan, 1980; Glasby, 1979; and Schott, 1976). To put this in better perspective, consider the effect on Colombia's economy if all the world's current offshore minerals production, excluding oil and gas, were somehow shifted to Colombia's account. This hypothetical input would still only barely double the size of Colombia's small mineral sector. If capturing all production that has proved economic from the earth's offshore mineral endowment would produce such a surprisingly small gain for Colombia's economy, it seems hard to justify much optimism for significant near- or medium-term contributions from the offshore potential actually confined to Colombia alone.

C. The Absolute and Comparative Importance of Offshore Oil and Gas

Offshore oil and gas are far and away the most important marine minerals and energy source, both in the absolute size of current offshore production and revenues and in their proportion of total (onshore plus offshore) output. Total world offshore production of crude oil (5 billion barrels in 1980) accounts for about a quarter of total world production (21.7 billion barrels in 1980) (API, 1982). Offshore production has nearly doubled since 1970 (2.7 billion barrels), and its proportion of total production has risen in that time from 16 to nearly 25% (API, 1982). Offshore natural gas production, meanwhile, was increasing from 14% of global natural gas output in 1970 to nearly 20% by 1980. In 1978, $(10 \times 10^{12} \text{ ft.}^3)$ of world total gas production of $(52 \times 10^{12} \text{ ft.}^3)$ came from offshore sources. Offshore oil production of $(5 \times 10^9 \text{ barrels})$, conservatively valued at \$10/barrel, combined with the $(10 \times 10^{12} \text{ ft.}^3)$ of offshore gas production, conservatively valued at $\$1/\text{ft.}^3 \times 10^3$, therefore generate gross revenues on the order of at least \$110 billion per year. In comparison, the combined gross value of all other offshore minerals production worldwide is closer to \$0.5 billion, or less than one-half percent of the value of offshore oil and gas production.

Within Colombia's own region, Venezuela, coastal neighbor to the east, produced over 400 million barrels of crude offshore in 1980, nearly half its total output. Offshore oil, priced at the official government selling price of around \$30/barrel, thus represents potential annual revenues to Venezuela on the order of \$12 billion. Trinidad-Tobago is also a major offshore producer in the region as are Mexico and Peru. Colombia has no offshore oil production but produces important quantities of gas offshore. As seen in Table 3.3, offshore gas production in 1982 has been reported as 99.1 million cubic feet per day, a 6.4% decline from 1981 levels. With production declines in the offshore Guajira wells, the share of offshore gas in national output will fall unless new offshore discoveries are made. Worldwide, offshore oil and gas have lately followed the petroleum market into a slump. Still, in terms of the revenue potential of marine minerals and energy, nothing else even comes close.

TABLE 3.3

WORLD OFFSHORE GAS PRODUCTION
(MMcfd)

Country	1982	1981	1980	1979	1978	1982-1981	
						Change	% Change
United States	13,757.48	13,272.55	14,703.27	12,937.30	13,983.84	+484.93	+ 3.6
United Kingdom	3,703.00	3,462.00	3,610.00	3,981.48	3,925.92	+241	+ 6.9
Norway	2,500.00	2,837.48	2,426.00	2,252.79	1,375.00	-337.48	- 11.9
U.S.S.R.	1,420.00	1,332.00	1,225.00	1,161.00	1,064.00	+ 88	+ 6.6
Netherlands	1,071.00	1,140.00	1,170.00	1,062.33	530.00*	- 69	- 6.0
Italy	1,018.00	884.00	22.00	23.00	38.00	+134	+ 15.2
Mexico	895.90	584.65	25.00*	22.80	107.90	+311.25	+ 53.2
Brunei	850.00	875.00	984.80	1,030.00	988.00	- 25	- 2.9
Australia	550.00	551.67	388.00	504.00	847.00	- 1.67	- 0.3
Indonesia	550.00	632.00	440.00	439.28	561.00	- 82	- 13.0
Nigeria	500.00	261.06	500.00	500.00	220.00*	+238.94	+ 91.5
Trinidad/Tobago	488.30	500.00	420.00	404.40	428.50	- 11.7	- 2.3
Abu Dhabi	317.00	710.00	1,434.00	627.00	629.00	-393	- 55.3
New Zealand	163.00	83.95	84.04	25.18	---	+ 79.05	+ 94.2
Ireland	150.00	124.00	125.00	125.00	1.79	+ 26	+ 21.0
India	141.00	2.20	2.67	48.52	3.44	+138.8	+6309.1
Colombia	99.10	156.00	64.72	33.00	---	- 56.9	- 36.5
Egypt	73.00	60.00	57.85	65.00	72.00	+ 13	+ 21.7
Japan	27.70	30.00	47.70	35.00	60.00	- 2.3	- 7.7
Ghana	7.40	8.00	8.00	---	---	- 0.6	- 7.5
Brazil	4.76	116.14	100.00	91.38	65.92	-113.38	- 95.9
Gabon	NA	7.80	0.00	0.00	.60	NA	NA
WORLD TOTALS	28,292.30	27,630.50	27,838.05	25,668.46	26,051.98		

*Estimate Nigerian Gulf Oil Co. only

SOURCE: "Drilling Up...", Offshore, 1983. (Petroconsultants, Geneva).

D. The Limited Worldwide Role of Marine Minerals

As Table 3.4 shows, the other marine minerals being produced at various places in the world are relatively minor economically, both in terms of total revenues and in terms of their share of the commodities' total output. Offshore tin production, with a 1977 value of \$85 million, is the most proportionately important in its own market, representing over 6% of the world production value of tin. U.S. sulfur production from the Gulf of Mexico appears to comprise an appreciable share of the world sulfur market, at nearly 3% in 1977, but that share has fallen off dramatically in recent years as the market has been flooded by products from the increased use of stack-gas scrubbers and other sulfur-capturing pollution control equipment.

All other minerals produced offshore account for less than one per cent of their respective commodity markets. It is interesting to note that the value of offshore sand and gravel production is double the next leading offshore mineral, calcium carbonate. Together these two commodities account for over 60% of offshore minerals value (excluding oil and gas, of course). These commodities, however, have a relatively low unit-value, are expensive to transport, and so are produced almost exclusively for local consumption as building materials or bulk constituents. For this reason, while they may hold some promise of relieving local building supply problems or increasing employment on a local level, they show very little promise as export revenue earners (though high-quality aragonite produced in the Bahamas is exported to the United States, and some British gravel production is delivered to the Continent). Other mineral commodities that have in the past been produced on a minor scale from marine sources are gold, silver, chrome, diamonds and such byproducts of offshore tin production as titanium, zirconium, and rare earths. Magnesium, sodium, iodine and bromine are extracted from seawater.

E. The Relative Promise of Offshore Oil and Gas

Understanding the relative positions of various marine minerals on a global and regional basis, a question arises: In which of these minerals does Colombia appear to be particularly well-endowed or in some way especially favored? On the basis of what is known at present, the answer seems to be: If

TABLE 3.4

ESTIMATED OUTPUT OF MARINE MINING INDUSTRY IN 1977

Commodity and Country	Production (thousand tonnes)	Value (US \$million)	% offshore production by value	% of world production by value
Sand and Gravel				
United Kingdom	15,700	50.0		
Japan	41,300	86.7		
Denmark	9,500	14.8		
Holland	7,500	15.8		
Sweden	950	2.1		
USA	4,000	8.4		
Others	7,000	11.6		
		189.4	41.1	1
Tin				
Indonesia	10.0	62.0		
Thailand	3.2	20.0		
USSR	0.5	3.0		
		85.0	18.5	6.1
Calcium Carbonate				
USA	14,000	67.0		
France	900	25.0		
Iceland	160	0.8		
Fiji	80	0.1		
Bahamas	900	1.5		
Others	250	0.8		
		95.2	20.7	1
Sulphur				
USA	1,500	90.0	19.6	2.9
Barytes				
USA	2	0.1		1
			0.1	
Ironsands				
Japan	30	0.5		1
Philippines	--	--		
		0.5		
Total		460.2	100.0	

Estimates of production are for year 1977 or estimated from latest information. Value estimates are based on 1977 price and value information.

Data Supplied by D. Horne and A.A. Archer (Institute of Geological Sciences, London)

SOURCES: G.P. Glasby. 1979. Minerals from the sea. Endeavour n.s.3, 82-85.

in any, it is probably in oil and gas. However, as the worldwide market is now in a slump, there is little reason to expect immediate interest in expanded offshore exploration or immediate payoff from such exploration.

Within ECOPETROL, and evidently also within Associated companies, it has been concluded that for the time being most promising oil and gas prospects are onshore rather than offshore. This is manifest in the onshore concentration of exploratory drilling shown in Figure 3.1. Concentration of effort onshore is not too surprising in light of the fact that Colombia's continental surface of some 1,138,914 km² is nearly 25 times greater than the area of Colombia's 47,000 km² continental shelf (ECOPETROL, Sasaima, 1983). Also, the cost of drilling onshore is less than offshore drilling by a factor of 3 or 4 (Sala, D. pers. comm., 1983; Moros, "Offshore...", 1983). Over the past decade, the estimated average mix of onshore versus offshore exploration expenditures has been roughly 90% onshore and 10% offshore (Sala, D. pers. comm., 1983). ECOPETROL sources anticipate that over the next 5 years the mix is likely to be closer to 95% onshore and 5% offshore (Sala, D. pers. comm., 1983). This reflects both increasing interest in certain inland areas with high payoff potential and declining expectations for offshore oil and gas potential in the near term.

Nonetheless, the long term prospects for oil and gas offshore Colombia are widely regarded as good. ECOPETROL has already identified 66 potential trap structures in the Pacific that could hold producible hydrocarbons, as the size of commercial deposits declines in the future. A number of traps have also been identified on the Caribbean shelf, where Venezuelan success and the apparent presence of fine-grain thick sediments for source beds and reservoir beds point to good future prospects (K.O. Emery, pers. comm., 1983). As Earney (1980) writes, "Several offshore areas in Latin America are emerging as potentially important petroliferous regions, including the coasts of Brazil, Uruguay, Argentina, COLOMBIA and Mexico. These frontier regions could become especially important as petroleum sources for the Western world." Furthermore, Colombia can look forward hopefully to the long-term possibility of deep water production from deposits lying even beyond the shelf. As indicated by Figure 3.2, technical capabilities for such deep operations have been increasing rapidly in recent years.

FIGURE 3.1
EXPLORATORY TESTS IN COLOMBIA IN 1981

SOURCE: "World Energy Developments," 1982.

FIGURE 3.2

WORLDWIDE WATER DEPTH RECORDS

SOURCE: API, 1982.

F. Marine Minerals Potential in Colombia

A variety of factors, in addition to limited knowledge of resource endowment, severely limit the near-term, and even long-term, prospects for a meaningful contribution by marine minerals to Colombia's economic growth. Based on past or current economic contribution, either in Colombia or elsewhere in the world, or because of circumstances peculiar to Colombia, six possibilities are examined here: 1) iron sands; 2) phosphates; 3) sulfur; 4) sand and gravel; 5) gold; and 6) salt.

Iron sands

Black sands rich in iron, chrome and titanium are known to occur in Colombia as beach deposits of marine origin (Martinez, 1983). As seen in Table 3.4, such deposits have been economically exploited in Japan and are under development in the Phillipines as a source of chrome. A project is also underway in Italy to explore the potential of these sands (Germinal, 1983). Chrome is a critical commodity for highly industrialized economies and one with very concentrated and vulnerable sources of supply. Extremely little is known, however, about the nature or potential of Colombia's deposits.

Phosphates

Extraction of phosphates from marine phosphorites or phosphatic sands has long been proposed as a promising use of marine resources (Manheim and Hess, 1981; Pasho, 1973; Kaufman, 1970; Dietz, Emery and Shepard, 1942). Resource surveys have recently been undertaken in the U.S.A., New Zealand, Fiji, French Polynesia, and the USSR (Germinal, 1983). In Latin America, a survey of phosphorites off the coast of Peru was conducted last year with Lamont Doherty's R/V Robert Conrad (Germinal, 1983, p.12). Mexico, through ROFOMEX, has acquired two dredges for the recovery of phosphatic sands in Lower California (Germinal, 1983, p.40). In Colombia, phosphates are an important source of fertilizer, and ECOMINAS has been attempting to industrialize the production of phosphates from phosphoric rocks (ECOMINAS, Informe Anual, 1983; and ECOMINAS, December, 1981). Substantial investments in these deposits, which are located in the center of the country near to the major sources of demand, reduces even conjectural interest in the prospects for offshore or coastal deposits. In any event, manifestations of marine deposits have been reported only in San Andrés, Malpelo, and Serrania Bahía de Portete (Martinez, Sasaima, 1983). Little more than that is now known, but it is difficult to see this as a marine resource of significant potential for Colombia.

Sulfur

Sulfur has not been reported as a marine mineral in Colombia (Martinez, Sasaima, 1983), but it is mentioned here because this commodity has been produced economically from deposits in the U.S. Gulf of Mexico and because there are some indications of growing market prospects for sulfur in Colombia. ECOMINAS has estimated that 1982 production of some 50,000 tons

from Colombia's two principal sulfur sources, the plant of Industrias Purace S.A. and the ECOPETROL plant at Barranca, was utterly inadequate to meet domestic consumption of over 120,000 tons (ECOMINAS, February, 1982). In fact, ECOMINAS has concluded that the market potential for sulfur is sufficient to justify development of a major port facility on the Pacific Coast (ECOMINAS, February, 1982). In spite of expanding market prospects, the potential for a share to marine sources must be considered long-term at best. As in the U.S. case, marine sulfur would face increasingly dominant competition from waste sulfur products of sulfur-capturing pollution control equipment as more and more coal is burned for energy. Furthermore, we are aware of no indication of promising offshore sulfur deposits in Colombia.

Sand, gravel, and shell

As Table 3.4 shows, sand and gravel are the most economically important non-hydrocarbon marine minerals products. Including the similar sand and shell products of calcium carbonate (such as Bahaman aragonite) in this category, total output of these commodities was valued in recent years at over 60% of the total commercial volume of offshore minerals. In Colombia, there are large coastal zone deposits of sand and gravel being exploited for a variety of building materials (Martinez, 1983). Because of the abundance and location of these deposits, however, it has not proved necessary to resort to higher-cost production of submarine deposits. Nonetheless, depending on the location of future construction activities offshore deposits may prove economic (Padan, 1983). This is because transportation costs as a proportion of total cost rise very quickly with distance hauled for such low-value commodities. For the same reason, these materials are produced almost exclusively for local use and show very little promise as an export revenue earner. There is an export market for lime, some of which is found in beach deposits, but most of this resource appears to occur in the interior (Martinez, 1983). Deposits of siliceas sands have also been identified in the coastal zone, and demand for this high-grade material useful in glass manufacture has shown rapid growth. Abundant onshore resources and the high cost of offshore exploration and exploitation appear to remove to the distant future the possibility of large scale production of any of these materials from marine sources in Colombia (Martinez, 1983).

Gold

Gold is a major mineral product and significant export earner for Colombia, and it is one that has the appearance of possible special promise for supplemental production offshore. Some 60% of national production comes from alluvial sources, so the domestic industry has the advantage of long operating experience in a subaqueous environment. Further, the importance of riverbed deposits, especially those near the Pacific Coast, might be interpreted as a promising indication for offshore heavy mineral placers of alluvial origin. As concluded by participants at the Plan Maestro Taller de Trabajo in Sasaima:

Due to the lack of geological and mineral research along the coastal zone, the extent to which these minerals (gold, silver, and platinum) occur there is unknown. However, through research conducted by INGEOMINAS and the United Nations, good possibilities

have been shown to exist for these minerals in alluvial deposits and in waterways with outflows to the Pacific in general. Considering the nature of the region and its wealth in low level deposits of these minerals, it is hoped that they exist in the coastal zone, especially associated with the beaches themselves or the surrounding coastal terraces.

These hopes must be qualified, however, by findings in the scientific literature that, except under unusual circumstances, economic placers of these minerals will be confined to stream deposits because their high specific gravity allows them to be relatively easily trapped and held in river beds (Emery and Noakes, 1968). Thus they typically are not transported very far from their source rocks: in fact, the median distance from the source of economic placer deposits of coarse gold and platinum has been estimated to be less than 15 kilometers (Emery and Noakes, 1968). Virtually all the mountainous sources of Colombia's river placers are much farther from the coast than this. An additional negative factor is the apparent inefficiency and disarray of the existing gold mining industry (ECOMINAS, 1983; ECOMINAS, November-December, 1982; and DNP et al., 1983). Although the resulting higher costs of onshore production might enhance the perceived relative promise of more speculative offshore sources, a greater contribution to national development might be expected from more efficient working of known sources than from the possible discovery and development of marine or beach deposits. Such efficiency gains would at the same time tend to reduce the economic potential of possible marine sources.

Salt

It was concluded by a Plan Maestro working group in September that, "Marine salt was not considered an (economically) exploitable resource" (Plan Maestro, September, 1983). In spite of this rather negative evaluation, several factors do point to a continuing, and perhaps increasing contribution to Colombia's economy from marine salt production. Output from the marine evaporites at Galerazamba is among the largest in South America, and the production capacity at Manaure in Guajira is one of the most extensive in the world (ECOMINAS, March, 1982). As seen in Table 3.5, marine salt has provided between nearly a quarter to 40% of total national salt production since 1979. This production has accounted for between 45% to 50% of domestic salt revenues, as shown in Table 3.6. While 130 million to 180 million pesos (roughly \$1.75-2.4 million) is a negligible fraction of total GNP, it is on the same order of importance as Colombia's iron ore or platinum production during the same period and so is not to be neglected.

The apparently spontaneous growth of private production on Colombia's North Coast to supplement the authorized activities of Concesión de Salinas may be an indication of latent economic potential (ECOMINAS, April, 1982). Such private production, however, may merely reflect governmental policies designed to sustain artisanal salt production in the Guajira region. It has been estimated that these policies result in production costs three times those that could be realized with more efficient mechanized operations (Millán et al, 1980). If alternative avenues to achieve the goals of these social policies were found in the future, with modern production techniques introduced into marine salt production, it seems likely that marine salt could

TABLE 3.5

NATIONAL SALT PRODUCTION

(Tons)

	1979	1980	1981	1982*
Land	942,218	936,208	807,590	826,833
- Gachetá	3,760	4,300	4,214	1,189
- Nemocón	108,027	122,727	109,046	116,823
- Upín	55,914	58,536	47,689	46,862
- Zipaquirá	774,517	750,645	646,641	661,959
Marine	378,581	586,159	521,759	255,340
- Galerazamba	20,274	29,203	26,439	16,364
- Manaure	337,662	512,416	452,799	213,017
- Mamonal	20,645	44,540	42,521	25,959
TOTALS	1,320,799	1,522,367	1,329,349	1,082,173
Marine				
Shore	28.7%	38.5%	39.3%	23.6%

*Only in the first half of the year.

SOURCE: Millán, 1980.

TABLE 3.6

NATIONAL SALT SALES*

(Thousands of Pesos)

	<u>1980</u>	<u>1981</u>	<u>1982</u>
Land	186,504	136,714	159,549
Marine	<u>153,330</u>	<u>173,614</u>	<u>129,609</u>
TOTAL	339,834	315,328	289,158
Share of Marine	45.1%	56.6%	44.8%

*Does not include processed salt or salt exported from Planta de Soda and Manaure. Includes only rough salt.

SOURCE: Millán, 1980.

make substantial gains in overall market share.

Marine salt may not prove to be a major export product, but Concesión de Salinas began exports of washed grain salt to the United States in 1979 and has announced construction of a major new marine salt processing facility in Bahía Honda (Guajira) (ECOMINAS, April, 1982, March, 1982). The new plant, scheduled for completion in 1985-86, is estimated to cost \$20-25 million and to justify adaptation of the port facilities at Bahía Portete (ECOMINAS, March, 1982).

Within the marine minerals sector, marine salt is one of only two materials actually to have proven its economic value through current production and marketing. As such it would seem to warrant the continued attention of those interested in Colombia's marine resources potential.

G. The Fading Interest in Seabed Manganese Nodules

Seabed manganese nodule deposits have been identified as potential sources of nickel, cobalt, copper, and manganese for several years. They are extensively distributed over the world's ocean floor, and hundreds of millions of dollars have been spent by private companies and national governments to explore for and develop recovery technologies for this resource. Nodules have been identified in Colombia's EEZ, and there is some reason to think that high grade materials may exist there (INGEOMINAS, 1982). INGEOMINAS has plans for several joint agreements to accomplish, over a three year period, a survey and evaluation of polymetallic nodule deposits in the EEZ. Principal objectives are to: 1) locate areas in which the nodules are present; 2) evaluate the nodules' composition to identify areas with the highest grade materials; and 3) determine the main geological features of the seafloor in the surveyed areas (INGEOMINAS, 1982). Once again, a key question will be: with regard to manganese nodules, in what ways (location, grade, abundance, topography, cost, etc.) does Colombia appear to be particularly well-endowed or especially favored. INGEOMINAS' joint program approach seems to be a cost-effective way to answer this question and to benefit from joint research activities at the same time. Financial support for these efforts, however, appears to be uncertain.

Despite the absence of such basic studies, ECOMINAS has called for work toward the development of a seabed nodule processing facility and associated infrastructure, such as roads and energy facilities, in Chocó on Colombia's Pacific coast (ECOMINAS, June, 1982). Indeed, because of its location a site

in this area would seem to offer many advantages to a Pacific nodule mining operation. The ECOMINAS recommendations, however, appear to be based on the perhaps unrealistic expectation that deep seabed mining will be commercially realized by the end of the century (ECOMINAS, June, 1982). It must be emphasized here that manganese nodule mining has turned out to be a losing proposition for those companies which have invested in its development. In fact, many partner companies in the international seabed mining consortia have declined to continue contributing to their consortia, and several have dropped out altogether.

These decisions are based not solely on dissatisfaction with the unresolved and uncertain international legal regime, but rather on a more pessimistic appraisal of the overall economic potential of seabed mining. Over the past decade, as more has been learned of the nature of the resource, downward revisions have been made in both its abundance and grade (UN, 1982). Optimistic metal market projections used at the time of many entry decisions have been revised downward, and constant-dollar estimates of seabed mining costs have shown a trend of steady growth over the past decade (Dick, 1981; Manser, 1981; and Chacko, 1978). The best recent estimates put capital costs of a seabed mining operation at over \$1.5 billion and show unacceptably low expected rates of return on investment (Black, 1980; CRA, 1982). Further, these cost estimates are not adjusted for factors that have been identified in recent research as leading to huge underestimates of actual costs (Morrow et al., 1981 and 1979). In the case of many new processing technologies, such biases have been found to engender canceled plans, wasted costly design efforts, and significant losses from premature capital commitments. (Morrow et al., 1979).

Even in those areas of the world's oceans that have been intensively explored by companies spending hundreds of millions of dollars on industrial R&D, the near-term commercial prospects for manganese nodules are very poor, and their long-term prospects are uncertain. Substantial commitments to the speculative development of coastal processing facilities and infrastructure in Colombia, whether through direct expenditures or through fiscal inducements, may well be premature and potentially wasteful. Information on these deposits, on the technology for their recovery, on the legal and political

situation surrounding them, and on the world markets which concern them is nonetheless important to the country because of their possible long-term impact on Colombia's economy, either positive as a potential resource or negative as a possible source of competition for Colombian onshore production.

H. Economic Insignificance of Marine Polymetallic Sulfides

A great deal of interest has been expressed recently about the potential of polymetallic sulfide deposits of hydrothermal origin at seafloor crustal spreading centers and other geotectonically active zones. Much publicity has been devoted to the alleged in-place value of these deposits, with some authorities citing values of billions of dollars for a single deposit (Bischoff et al., 1983; Cruickshank, 1982; Malahoff, 1982). In fact, very little is known about the composition, extent, or metallic grade of such deposits. There is good scientific reason to suspect that they may be widely distributed with geotectonic activity, and there is also good reason to suspect that further study at such sites will yield valuable information for the exploration for conventional onshore deposits. There is little reason to expect, however, that marine polymetallic sulfides will have commercial value in their own right in the foreseeable future. Rather, results of a detailed economic analysis underway at WHOI suggest that these deposits have essentially zero present value as a mineral resource (Broadus, 1984; Broadus and Bowen, 1983).

I. OTEC and Ocean Energy Exotics

Ocean thermal energy conversion (OTEC) is an experimental technology for generating electricity from the temperature difference between warm water at the ocean surface and cold water deep below. The temperature differential most often used as a minimum standard for the OTEC "resource" is 20°C (NOAA, 1982). As can be seen in Figure 3.3, this differential is found off both Colombia's coasts (ranging from 20° to 22° in most of Colombia's Pacific area and reaching 22° throughout the Caribbean basin). The mere presence of this differential, however, does not create an economic potential; and, in fact, the role of OTEC as an energy source in Colombia must be seen as extremely remote. Colombia's untapped hydroelectric potential ranks among the

FIGURE 3.3

THE OTEC THERMAL RESOURCE AREA
(Atlantic Ocean)

< 1000 m deep

*Contours indicate temperature differential (°C) between surface and 1000 m depth

SOURCE: NOAA, 1982

highest in South America, and about 70% of this potential is available in areas where 84% of the population resides (Martino, 1981). In the 1970's, the role of coal and hydroelectricity in the nation's total primary energy production doubled, and the Plan de Integración Nacional indicates that, because of the great availability of hydro resources and the comparatively low costs of their exploitation, expanded generation in the electrical sector to the year 2,000 will be based largely on hydroelectric projects (Ministerio de Minas y Energía, DNP, 1982). After the year 2,000 the role of the country's coal resources is expected to become increasingly important. The same factors also limit the prospects for ocean energy generation based on salinity gradients, waves, currents or tidal cycles (Moros, "Recursos", 1983). Still, there is no need to abandon the monitoring of technical developments elsewhere, since if they are sufficiently rapid OTEC or other ocean energy exotics could in special circumstances offer the most effective energy supply for some remote coastal areas.

J. Study, Diversity and Flexibility as Response to Uncertainty

In general, very little is known about Colombia's marine minerals and energy endowment. The potential of Colombia's marine minerals and energy sector is thus surrounded in uncertainty. A few well-established rules for dealing with uncertainty are: study, diversify, and maintain flexibility (Gilbert, et al., 1978). Each of these rules is being adhered to in Colombia.

Along with other proposed investigations, efforts have been made by INGEOMINAS to initiate studies that would increase information about both the Atlantic and Pacific continental margins. Five principal projects in marine geology have been planned or proposed by INGEOMINAS (Martinez, pers. comm., 1983):

- (1) Geologic and faunal survey of the Caribbean coastal zone;
- (2) Geologic exploration of the Pacific coastal zone from Panama to Bahía Salano;
- (3) Study of Colombia's Atlantic and Pacific continental margins;
- (4) Geologic study of the San Andrés and Providencia archipelago (with the U.S. Geological Survey);

- (5) Mapping of the Pacific continental shelf and survey of the abyssal deeps.

Of these five programs, only the final three would provide direct information on offshore mineral occurrences. With the cost of ship time estimated at over \$3000 per day, execution of these projects will be very costly and require careful advance planning and coordination (Martinez, pers. comm., 1983). Supplemental funds do seem to be available from U.S. partners for studies (3) and (4), but financial support for the INGEOMINAS role has been more uncertain. One source of that uncertainty may have been an inability to synchronize funding applications with scheduling of ship time (Steer, pers. comm., 1983). It is also not apparent, with respect to studies (3), (4) and (5), that INGEOMINAS has helped target its research and avoided duplication by gaining access to and fully utilizing data gathered by ECOPETROL in offshore oil exploration.

With these exceptions, and in light of the great uncertainties about the minerals endowment of Colombia's offshore areas, the INGEOMINAS projects seem well-targeted and appropriately broad. Because of the extremely speculative nature of the future value of marine minerals, however, it is at this time difficult to justify on economic grounds major national expenditures for their exploration. Funding commitments of this kind might be better based on scientific selection criteria rather than on the promise of economic return.

ECOPETROL appears to be well-situated, along with its associated companies, to evaluate the relative promise of offshore and onshore hydrocarbon prospects. For the near term, the best prospects have been judged to be onshore. Basic, cost-effective survey and study would thus seem to be all that is required to pursue the longer-term prospects offshore. Such basic study can be accomplished through both independent and collaborative efforts of ECOPETROL, CIOH, INGEOMINAS, and academic researchers. Much work is already underway (ECOPETROL, Sasaima, 1983; Chona and Bendeck, 1983).

With a 20-1 cost advantage over onshore seismic exploration (roughly \$5,000/km onshore to \$250/km offshore), seismic work offshore is a relatively inexpensive technique for identifying promising features (Sala, D., pers.

comm., 1983). As shown in Figures 3.4 and 3.5, an ambitious and extensive program of seismic work has been conducted on the Colombian continental shelf. For special studies of a more general nature, ECOPETROL can contract for the services of INGEOMINAS. Because of the proprietary value of seismic information on offshore hydrocarbon prospects, however, there may be less opportunity for flow of information in the other direction. It is difficult from interviews to determine how much effort has been made by INGEOMINAS to obtain and use information developed by ECOPETROL and its Associates or how much difficulty may have been encountered in such efforts. There can be little doubt, however, that such information would also have value in guiding understanding of the even longer-term prospects for other marine mineral resources within Colombian jurisdiction.

Generally, the ECOPETROL data that we have seen tend to be classified according to 13 sedimentary basins or regions (cuencas). Within this geologically rational classification scheme, four regions (Pacífica y Valle del Atrato, Bajo Magdalena y Caribe, Guajira, and Los Cayos) combine both onshore and offshore areas. Thus, without separately-reported onshore and offshore data, this system can create difficulties for researchers and policy makers wishing explicitly to analyze and compare onshore and offshore activities and endowment.

Overall, the government's current posture of study and evaluation of Colombian marine minerals appears to be diverse and to permit a flexible response to unexpected opportunities or impediments as they may arise.

K. Potential Problems in Marine Minerals Development and Management

What are the most prominent problems that can be anticipated at this time? The most obvious concerns human resources. Tremendous payoffs are achievable in any development activity from investment in education and training. Colombia is fortunate to have a cadre of well-qualified experts working in the marine minerals area, but even these individuals could benefit from increased contact with foreign colleagues and expanded opportunities for specialized training and experience. The joint study arrangements that have been entered into or that are anticipated represent a promising avenue for such enhancement.

FIGURE 3.4

MARINE AREAS WITH GEOPHYSICAL PROSPECTING

SOURCE: Plan Maestro, Sasaima, 1983.

PERU

FIGURE 3.5
MARINE SEISMIC PROGRAM IN COLOMBIA

SOURCE: Plan Maestro, Sasaima, 1983.

Another possible problem is in the interpretation and management of existing data. Even the most detailed data are of little use unless carefully organized and interpreted. There is sometimes a tendency at research organizations to collect new data before those data on hand have been organized and analyzed. Indeed, re-working and reevaluating data that have already been analyzed can often lead to greater increases in information, on a more cost-effective basis, than the costly collection of vast new stores of data.

L. The Threat of Interagency Conflict

Another potential problem that has been experienced by other nations pursuing the development of offshore minerals is disruptive conflict between agencies having interests in the area. Both the United States and France, for example, in their marine minerals efforts, have witnessed and been distracted by jurisdictional conflicts between the agency or agencies concerned with geology and mining, on the one hand, and those concerned with ocean activities on the other. This problem does not seem to have arisen in any serious way in the Colombian context. It is incipient, however, in a situation where one agency has authority in the medium in which the commodity is produced and another agency oversees production of the commodity. Frequent consultation, shared purpose, clear delineation of authority, and open lines of communication seem to help alleviate the problem. We have not detected any particular lack of these qualities in the management of Colombia's marine minerals resources, but strong interests in playing leading roles in future management and development of marine mineral prospects have been expressed by at least ECOMINAS (Morcillo, 1980), INGEOMINAS (Lopez Reina, 1981; INGEOMINAS, May 1983), and DIMAR (Plan Maestro, June 1983). The potential for wasted effort and costly confusion through interagency rivalry is one that might warrant specific attention in the formulation of a marine resources master plan.

M. Clarification of Legal and Jurisdictional Structure

Colombia does not now appear to possess a set of statutes and regulations specifically directed to exploration and development of marine mineral resources. One interpretation of this situation is that marine mineral

activities are thus controlled by the same rules and regulations as onshore minerals. As participants at the September 20 Plan Maestro workshop on ocean minerals and energy concluded, "In general the legislation with respect to these resources in the sea is no different from the continent." (Plan Maestro, Sept. 1983.) Yet clear legal authority does seem to exist for DIMAR's involvement in offshore development activities, and stipulations are made in several instances for consultation with INDERENA and other concerned agencies (Ramos, pers. comm., 1983).

As no effort has been made to obtain license to develop offshore nonenergy minerals, conclusions about the necessary procedures and standards of compliance are hypothetical at this point rather than based on experience. Nonetheless, it could be argued that such development could take place under existing law and that the structure of authority governing it would be somewhat different than that governing onshore mineral activities.

In the case of oil and gas, there is little regulatory distinction between offshore and onshore activities because of the broad authority vested in ECOPETROL for hydrocarbon development. Exploration and development associations have been assigned large geographic areas, several of which contain both offshore and onshore zones (ECOPETROL, 1982). Neither of these zones seems to be treated differently from the other in a legal or administrative sense, with the exception that DIMAR must be notified and grant clearance for associated marine activities.

There may well be good reason for a separate legal-regulatory structure for offshore minerals and energy. Substantially different technological and environmental factors are involved in marine operations, and the structure of risks faced by private enterprise, by the government, and by the public may differ from the typical onshore case. Internationally, significant differences between offshore and onshore cases can be observed in the format of contracts for hydrocarbon development projects. Such differences in themselves argue that the structure of risks is different in the two cases and that separately designed regulatory systems may be appropriate. It is not immediately obvious, however, that such differences are sufficient to imply entirely different legal, regulatory, and administrative frameworks in

Colombia. We note that the existence of a separate system of marine minerals and energy regulation and management in the United States can be explained as well by historical accident as by rational design. The exact nature of the way in which risks might differ in the Colombian context and the implication for appropriate legal-administrative designs is a topic warranting further study.

Fortunately, careful study of this issue should be possible prior to the commencement of any new legislative or regulatory initiatives to design and install separate systems. Too much legal structure too soon can be expensive and even harmful. By prematurely imposing rules and regulations that turn out to be inappropriate to the mix and type of activities which eventually emerge as most promising, the timely contribution of marine minerals and energy to the country's economy could be impeded. We are aware of no evidence that the absence of a separate legal-regulatory structure for offshore minerals and energy has as yet hindered the development of their potential.

The scope and overview associated with a long-range planning exercise, such as Plan Maestro de Desarrollo Marítimo or Plan Nacional de Desarrollo Minero, would seem to provide an ideal context within which to address this question. As a diagnostic observation, however, we note that marine minerals do not seem to be explicitly included in any way, even within the areas devoted to projections of demand and commercialization, legislation and negotiation, exploration, and finance, in the Plan Nacional de Desarrollo Minero.

N. Effects of International Disputes on Marine Minerals Activities

A few offshore areas are subject to dispute between Colombia and neighboring countries. There are, for example, active disputes with Venezuela over areas of the Gulf of Venezuela, with Los Monjes islands off Guajira claimed by both countries. Also, clear understandings have yet to be achieved with Nicaragua about control of certain areas of the Caribbean shelf related to the archipelago of San Andrés and Providencia. The effects of such disputes on the pace and prospects of offshore mineral and energy development is not clear, especially as the outlook is uncertain even in the absence of

such disputes. Still, on the basis of simple economic principles and experience in other contexts, it is possible to conjecture about the effects of these international disputes.

Take first a case where an exploitable nonrenewable resource is known to exist and can be independently extracted by separate parties (as with a "common property" resource or an oil pool that spans property lines). The expectation is that each party will accelerate its own extraction efforts in order to get as much out as possible before the other does. This behavior may result in an excessive total expenditure to exploit the resource.

In contrast, consider the case where the presence of an exploitable resource is uncertain and where unencumbered access for exploitation would be in doubt anyway because of territorial dispute. If costly investment is required to find a resource, uncertainty about eventual title and access to it will act as an additional cost and discourage such investment in exploration activities. Thus, too little may be spent to bring the resource into use. Because the presence of exploitable mineral and energy resources in offshore areas disputed with Colombia's neighbors is uncertain, and because exploration expenditures are necessary to find out if any are there, this latter case seems more descriptive of the actual situation.

It thus seems more likely that these jurisdictional disputes would discourage investment and retard the discovery and use of resources in disputed areas than that they would lead to excessive efforts at exploitation. By removing this obstacle, resolution of the disputes would tend to improve the chances for discovery and exploitation of mineral and energy resources that might exist in disputed areas.

9. Interactions and Integration with Other Sectors

Obviously, the designation of marine minerals and energy as a separate subsector within Colombia's marine sector is an artificial, if helpful, analytic device. In fact, activities comprising this artificial "subsector" not only span diverse onshore minerals and energy activities, they are closely related in various ways to other activities occurring in coastal and marine

areas. To avoid distorted conclusions from omission of these relationships it is useful to examine the nature of likely interactions between marine minerals and energy and the other "subsectors" within the overall marine sector.

A detailed examination would be a major undertaking in its own right and beyond the scope of this paper. It is possible, however, to begin to sketch in the most likely interactions, as portrayed in Table 3.7. The column headings in Table 3.7 are areas of possible interaction. They are divided into positive effects or complementarities and negative effects. The positive effects include complementarities in infrastructure development, information acquisition, creation of new demand for the other subsector's output, technological spinoffs and opportunities for shared support services. Possible negative effects are use conflicts and interference, environmental risk, and the creation of interagency conflict. The row headings designate the other subsectors that might be expected to interact with marine minerals and energy. For each area of interaction, each subsector is assigned a subjective "score" based on observation and experience in other contexts. The score rating attempts to combine both the magnitude and likelihood of each kind of interaction. Letters are used rather than numbers to emphasize the subjectivity of these assignments and to discourage any impulse to add or subtract among entries.

Unquestionably these ratings are highly subjective and incapable of capturing case-by-case heterogeneity and detail. Neither do they attempt to weigh the relative importance of the likely interaction effects: opportunities for information exchange are shown here as counting no less than adverse environmental side effects. Still, they may serve a useful purpose in the process of identifying interaction effects for planning purposes. Such side effects should be recognized to facilitate the capture of benefits and to anticipate, manage and reduce possible losses.

The area showing the strongest interactions with the largest number of other activities is infrastructure complementarities. This reflects the fact that successful staging of minerals development projects, and particularly offshore oil and gas projects, can require huge commitments for extensive development of local infrastructure, such as ports and harbors, housing,

TABLE 3.7

Likely Interaction Effects:
Marine Minerals and Energy With Other Marine and Coastal Uses

	Positive Interactions			Negative Interactions			
	Infrastructure Complementarities	Information Exchange	Demand Creation	Technological Spinoffs	Shared Support Services	Use Congestion Interference	Agency Conflict
Marine Science	P	M	M	M	P	S	P
Fisheries	P	S	S	U	M	P	M
Ports & Harbors	M	P	M	P	S	P	U
Maritime Transportation	M	P	M	S	M	P	U
Tourism	M	U	U	U	U	P	M
Intra-subsectoral	M	M	S	M	M	P	U

Key:

- M = Major interactions must be anticipated
P = Possibility of significant interactions in some instances
S = Some possibility of small interactions in special cases
U = Unlikely that appreciable interactions will occur

health facilities, roads and railroads. Because of the huge potential returns from oil and gas development, such investments may be made even if the benefits for other development activities are not recognized. Especially in remote or undeveloped areas, creation of additional infrastructure can increase the outlook for other marine transportation uses, open a new area for potential tourist development with means of access that could not be financed solely on the basis of expected tourism revenues, and enhance the prospects for profitable development of other offshore minerals that may be found in the region.

The area with the most apparent negative interactions in Table 3.7 is use conflict, congestion or interference. Some such interference from marine minerals and energy projects might affect fishing activities, ports and harbors, shipping activity in the vicinity, tourism, and perhaps other minerals projects. There is also a small chance of conflict with scientific activities. The next most prominent area of potential negative side effects is in the environmental risks imposed by minerals and energy projects on other marine activities. Thus, there may in some locales be threats to mangroves spawning grounds or congregating areas important to local fisheries; and there may be aesthetic or environmental degradation that discourages tourism in a region or locality. There is some possibility that ecosystems important for scientific investigation could be detrimentally affected by minerals projects, but it seems unlikely that environmental side effects would impinge on ports and harbors, marine transportation, or other marine minerals activities.

The marine subsector with the strongest apparent positive relationship to marine minerals and energy (other than other marine minerals) is marine science. Increased marine minerals and energy activities may provide infrastructure useful for scientific pursuits, would likely create large new stores of pertinent information, would definitely generate a demand for marine scientific information, and could promise technological developments with scientific applications. Major positive interactions are also indicated for ports and harbors and marine transportation. We note that minerals and energy activities might also demand and receive support services, such as charting, and sea-state or weather reporting, that could also be of major use to fishermen.

The activities showing the greatest potential of being harmed by marine minerals and energy efforts are tourism and fisheries. There is the possibility in both these sectors for interference by offshore exploration or production and for sponsor-agency conflict. More importantly, both fishing and tourism could expect serious environmental risk associated with offshore minerals and energy development.

It should be recalled in the context of these interactions that, in almost every case in Colombia, marine minerals and energy development is either in its incipiency or is extremely remote and speculative. Therefore, as with the question of a legal-regulatory structure, ample time seems to be available for further study and careful planning.

CHAPTER 4

A DIAGNOSIS OF COLOMBIAN MARITIME ACTIVITIES

Robert E. Bowen and Henry S. Marcus

I. OVERVIEW OF THE COLOMBIAN SHIPPING SECTOR

The influence of the maritime sector on the pace of national economic development should not be underestimated. The cost of transportation has, until recently, been a relatively neglected area with regards to its impact on developing country trade and commercial development. Recent studies have concluded that the structure of freight rates can have important detrimental effects on the nature and scope of developing country industrialization. Indeed, transportation costs appear to pose a more important trade barrier than do artificial trade control measures as tariffs and quotas (including most-favored-nation tariffs).

The overall situation in Colombia is unique in Latin America in that it is comprised of an almost exclusively private shipping fleet and a port system that is dominated by public sector planning and operation.

The shipping sector in Colombia is relatively small and has experienced a reasonably low rate of growth as compared to other Latin American fleets. Tables 4.1 through 4.6, taken from "Latin American Shipping, 1983, A Seatrade Guide," provide background on the Colombian-flag fleet. Table 4.1 shows a breakdown of the existing fleet, that consists of 30 deepsea vessels of average age 13.9 years and a coastal fleet of 7 ships of average age 16.0 years. The oldest segment of the deepsea fleet is the smaller general cargo ships with an average age of 21.1 years.

Table 4.2 presents information on the fleet development over the 1971 to 1983 time period. Over this period, the number of Colombian-flag vessels increased from 34 to 37. The average size of the vessels has also increased.

TABLE 4.1

FLEET TYPE ANALYSIS

Type grt	No.	Grt ^a	Dwt ^b	Dry	Reefer	Liquid	Total	TEUC	Passen- gers	Crew	(years)
Deepsea											
General cargo	17	127,196	159,383	203	31	10	244	280	655	21.1	41.0
Cargo (20knts +)	9	99,033	124,946	182	30	10	222	2,286	337	8.2	31.9
Multipurpose	2	28,028	41,401	55	5	0	60	464	64	8.1	9.0
Products tanker	1	24,136	39,865	0	0	52	52	0	45	8.0	7.8
Bulk carrier	1	18,028	26,828	35	0	0	35	0	24	12.0	5.8
Sub Total	30	296,421	392,423	475	66	72	613	3,030	1,125	13.9	95.5
Coastal											
Salt Carrier	5	11,234	10,858	14	0	0	14	0	128	12.6	3.6
General cargo	1	1,544	2,388	3	0	0	3	0	25	25.0	0.5
Products tanker	1	1,135	1,369	0	0	2	2	0	12	38.0	0.4
Sub Total	7	13,913	14,615	17	0	2	19	0	165	15.0	4.5
Total	37	310,334	407,038	492	66	74	632	3,030	1,290	14.0	100.0
				(77.8%)(10.4%)(11.7%)(100.0%)							

a Gross Registered Tons

b Deadweight Capacity

c Twenty-foot Equivalent Units

SOURCE: "Latin American Shipping, 1983, A Seatrade Guide."

TABLE 4.2

FLEET DEVELOPMENT, 1971-83
(vessels over 1 000grt)

Year	No.	Grt ^a	% State owned	No. of owners	Ave age (years)	Orderbook grt % national shipyards
1971	34	181,248	15	7	11.7	53,400 (-)
1972	35	197,214	14	6	11.2	29,800 (-)
1973	40	223,982	16	6	10.9	---
1974	40	212,337	8	6	10.9	---
1975	36	200,321	9	5	11.8	42,000 (-)
1976	34	193,173	9	6	12.8	84,000 (-)
1977	35	214,986	7	6	12.4	35,097 (-)
1978	36	239,771	7	6	12.2	32,122 (-)
1979	38	290,245	6	6	10.8	---
1980	40	277,488	6	7	12.8	---
1981	34	263,264	4	6	12.4	60,000 (-)
1982	33	270,792	4	6	12.8	60,000 (-)
1983	37	310,334	4	9	14.0	50,000 (-)

^a Gross Registered Tons

SOURCE: "Latin American Shipping, 1983, A Seatrade Guide."

The most striking statistic is that the percentage of state owned ships over this time period decreased from 15% to 4%. Table 4.3 is included in order to afford fleet comparisons between Colombia and other Latin American states.

Table 4.4 provides a breakdown of the Colombian-flag fleet by shipowner. Flota Mercante Grancolombiana (henceforth called Grancolombiana) is the dominant force with 65.7% of the fleet, while employing more than 2000 people. With an average ship age of 11.1 years, the Grancolombiana fleet is the youngest of any shipowner. In addition, their fleet will be updated with the delivery of 5 more new multipurpose vessels from Polish shipyards in 1983 and 1984, as shown in Table 4.5. (One of the 6 ship order has already been delivered.) These vessels are the only ones on order for the Colombian-flag fleet. The publication, "Latin American Shipping, 1983 A Seatrade Guide" also points out that private firms in Colombia own 11 flag of convenience vessels. These ships typically fly the flag of Panama and are on the order of 20 years or older.

A. Diagnostic Focus

A large number of factors are important to Colombia's development of a merchant marine policy. These factors are categorized as follows: (1) Comparative Industry Characteristics, (2) Trade-Related Impacts and (3) National Policy/Security Aspects.

The first category theoretically lends itself to a quantitative analysis comparing the national benefits of funds spent in the merchant marine sector to other industry sectors. However, typically data do not exist to perform detailed calculations. Nevertheless, some value can be derived from even a qualitative analysis of the issues.

The second category looks at trade-related impacts of having more national-flag vessels. For example, if national-flag ships can provide better service to Colombian customers than foreign flag competitors, the nation may significantly benefit with the expansion of its merchant marine.

TABLE 4.3
IBEROAMERICAN FLEET, BY COUNTRY, 1983

Country	No	Grt ^a	Dw ^b	Average Age
Brazil	333	5,313,945	8,863,937	7.0
Argentina	168	1,908,404	2,939,224	12.1
Mexico	94	1,263,607	1,989,154	10.9
Cuba	97	729,603	1,006,545	10.6
Venezuela	58	664,977	980,015	7.9
Peru	64	646,786	1,017,650	14.0
Ecuador	45	345,232	501,303	9.4
Chile	28	401,174	681,460	11.1
Colombia	37	310,334	407,038	14.0
Uruguay	18	182,614	296,189	15.9
Guatemala	5	25,901	36,367	21.9
Dominican Rep.	11	29,068	50,115	14.8
Paraguay	21	28,521	33,183	20.9
Bolivia	2	15,129	18,934	21.9
Costa Rica	5	11,643	15,835	13.1
Nicaragua	2	12,003	17,122	10.8
Total	988	11,888,941 (100.0%)	18,854,072	9.5

^a Gross Registered Tons

^b Deadweight Capacity

SOURCE: "Latin American Shipping, 1983, A Seatrade Guide."

TABLE 4.4

SHIPOWNING LEAGUE AND FLEET BREAKDOWN
(vessels over 1,000 grt)

Position 1983(82)	Shipowner	No.	Grt ^a	Dwt ^b	Ave age (years)	% share
1(1)	<u>State</u> Alco	5	11,234	10,858	12.6	3.6
	Sub total	5	11,234	10,858	12.6	3.6
	<u>Private</u>					
1(1)	Grancolombiana	17	204,027	253,487	11.1	65.7
2(-)	Granelco	2	36,056	54,087	12.0	11.6
3(2)	Agromar	5	25,178	39,729	23.3	8.1
4(-)	I.M. Del Caribe	4	19,485	28,868	25.6	6.3
5(-)	Pizano SA	1	7,795	10,522	37.0	2.5
6(3)	Maritimas INT	1	3,879	5,730	17.0	1.2
7(4)	Maritimas Eslait	1	1,544	2,388	25.0	0.5
8(5)	Dormar	1	1,135	1,369	38.0	0.4
	Sub total	32	299,100	396,180	14.1	96.3
	Total	37	310,334	407,038	14.0	100.0

^a Gross Registered Tons

^b Deadweight Capacity

SOURCE: "Latin American Shipping, 1983, A Seatrade Guide."

TABLE 4.5

ORDERBOOK, JANUARY 1, 1983

Name	Owner	Type	Grta ^a	Builder (Yard No.)	Deliver
Colombian ships on order at foreign yards					
Republica de Colombia	Grancolombiana	Multipurpose	10,000	Stoc.Gdan. (Po)	1983
----	Grancolombiana	Multipurpose	10,000	Stoc.Gdan. (Po)	1983
----	Grancolombiana	Multipurpose	10,000	Stoc.Gdan. (Po)	1984
----	Grancolombiana	Multipurpose	10,000	Stoc.Gdan. (Po)	1984
----	Grancolombiana	Multipurpose	10,000	Stoc.Gdan. (Po)	1984
Total building abroad		5	50,000		

^a Gross Registered Tons

SOURCE: "Latin American Shipping, 1983, A Seatrade Guide."

The third category has to do with national policy matters that often do not lend themselves to rigorous quantitative analysis. For example, to the extent that Colombia has committed itself to a policy of implementing the United Nations Conference on Trade and Development (UNCTAD) Liner Code, its merchant marine policy will definitely be affected. Other issues include: prestige of a national merchant marine, national defense aspects, and state owned versus privately owned national-flag vessels.

B. Comparative Industry Analysis

As with any large investment, merchant marine expansion is only one possible use of limited national funds. Alternative uses could be other industry sectors, such as fishing. Industry sectors can be compared in terms of jobs provided (both direct and indirect) and other economic factors (e.g. return on investment, balance of payments). These factors will be discussed for the merchant marine.

Direct Employment

Manning of deepsea vessels is not a labor-intensive activity. A ship costing tens of millions of dollars will have a crew size less than 50. The number of persons actually employed each year by each new ship will depend on the vacation policy for the seamen. To the extent that new seamen are brought in from foreign countries to man new vessels, this will decrease the benefit to Colombia. On the other hand, if skilled Colombian seamen are now unemployed, a merchant marine expansion would enable better use of their skills and energy. With sufficient data one could calculate the number of additional persons directly employed in the Colombian merchant marine for each incremental unit (e.g. one million dollars) of investment.

Indirect Employment

In addition to the persons directly employed in the merchant marine, others will become employed indirectly (e.g. the "multiplier" effect). For example, although Colombian shipyards do not build deepsea vessels, additional

Colombian-flag vessels may mean more work for Colombian ship repair yards. Additional jobs might also be created in other areas of Colombian economy such as: suppliers (e.g. paint, rope, food, fuel), banking, classification, and merchant marine training academies. The only jobs that should be counted are those that would result from an additional Colombian-flag vessel but not from a foreign-flag vessel. For example, the number of longshoremen employed will depend on the number of ships trading but not the flag of the vessel.

With sufficient data one could calculate the multiplier effect for the Colombian merchant marine (e.g. the number of jobs of indirect employment for each job of direct employment) and compare it with the ratio for the other industry sectors.

Other Economic Measures

Some basic economic measures are profit and return on investment; a benefit-cost ratio can also be used. In recent years the Grancolombiana fleet has been operating at a loss. However, worldwide shipping has been generally depressed so it is not obvious if an expanded Colombian merchant marine would be unprofitable as a long term venture. The economic feasibility of an expanded Colombian-flag fleet depends not only on the profit or loss of the new ships but also the impact on the profitability of the existing Colombian-flag fleet. It would be interesting to compare the costs of Colombian-flag vessel operations with those of existing competitors.

The impact of an expanded fleet on the country's balance of payments (BOP) is another relevant consideration. A major disadvantage is that new vessels will typically be purchased from outside Colombia creating a negative balance of payments impact. (However, the impact of purchasing foreign vessels at the present time is less than normal due to the depressed shipbuilding industry worldwide.) Other factors to be determined in the BOP calculation for an expanded merchant marine include: crew wages returning to Colombia (and wages to foreigners on Colombian-flag vessels that will leave the country), profits of new vessels, increased shorebased expenditure using more Colombian-flag vessels rather than foreign-flag vessels (e.g. food, repair, fuel, management) and the shadow price of Colombian currency.

C. Trade Related Impact

A key question is whether having more Colombian-flag vessels will result in more Colombian trade. In general, one would not expect the vessel flag to have a significant impact on the volume of trade, unless special conditions exist. Such conditions will be discussed for liner and bulk trades.

Liner Trades

Liner trades operate with rate-making cartels called conferences. Is there any reason to believe that the conferences are not acting in the best interests of Colombia? Does Colombia have adequate direct liner service to foreign countries? Are there too many occasions where Colombia is served indirectly via transshipment points or through feeder services? Is the country served by appropriate type and size of vessel? Is Colombia served with the appropriate sailing frequencies? If Colombia suffers from any of these problems, then the extent to which having more Colombian-flag vessels will alleviate or eliminate these differences is a key consideration.

Bulk Trades

Conferences do not exist in the bulk trades, so one would expect that Colombia is already receiving competitive prices on its movement of bulk goods. However, to the extent that the appropriate vessel types or sizes are not serving Colombia competitively, the expected impact of more Colombian-flag vessels becomes an important issue.

D. National Policy/Security Aspects

There are a number of national issues that affect the attitude of a government toward merchant marine expansion. These issues include: existing merchant marine policies, national defense/security, and state-owned versus privately-owned fleets. Key aspects of these issues are briefly discussed below.

Existing Merchant Marine Related Policies

A key issue at the present time is the UNCTAD Liner Code. For a nation like Colombia, the way in which it decides to implement the UNCTAD Liner Code will have a significant impact on its merchant marine. All nations signing the UNCTAD Liner Code agree with the right of a country to carry a significant portion of its foreign trade--typically assumed to be 40%--in national-flag vessels. To implement the Code a nation may want to set up administrative machinery to enforce the Code and to ensure that its merchant marine is of sufficient size to carry 40% of its foreign trade. At present, there may be a minor discrepancy between the UNCTAD Code (which allows for a 40% cargo reservation for Colombian hulls) and Colombian national Decree No. 1208 (dated July, 1969 and reserving 50% of trade for Colombian ships).

Other existing maritime policies will provide insight into aspects of the government attitude towards its merchant marine policy. For example, Colombia has already adopted both cabotage and cargo preference regulations. A type of policy that is difficult to describe, but is quite evident in some nations, is related to the general prestige and perception of "controlling one's destiny" that some governments feel accompanies having a merchant marine.

National Defense/Security

A merchant marine can serve many functions in aiding a country's defense and security. In time of war a merchant fleet is valuable in providing logistical support to the armed forces. A national-flag fleet can also insure that commercial trade is not terminated during a military conflict. In peacetime a merchant fleet may be able to aid a government by helping to patrol a 200 mile limit or aiding in the spotting of water-related smugglings activities. The key question here is to what extent an expanded merchant marine could greatly aid Colombia in national defense/security activities. From the limited amount of unclassified information existing on this topic, it appears that more Colombian flag vessels would have neither a significant nor direct impact on Colombian national security.

State-Owned Vs. Privately-Owned

Key considerations in choosing between state-owned and privately-owned fleets are cost control. It is important, therefore, to determine whether there are significant cost differences in the operation of state-owned versus privately-owned ships. In terms of potential national defense/security benefits, Colombia may wish to determine if there are significant differences in the amount of control the government could exert over state-owned versus privately-owned ships.

E. Benefits of Shipping

In evaluating the many issues mentioned in this paper, one must be careful to distinguish between having a national-flag fleet and the benefits of shipping. For example, many options exist for obtaining the benefits of shipping without actually owning a large merchant marine. As shown in Table 4.6, a country can derive benefits by controlling the allocation of cargo to vessels and the shipping rates. Even when a government gets involved in national-flag vessel operations, its capital commitments can be reduced by chartering rather than buying, and by engaging in joint ventures.

F. Overall Diagnostic Observations on Colombian Shipping

Although topics for further research are described below, five basic observations, resulting from examination and analysis of the evidence now available, are stated here.

1. The existing national-flag fleet brings various benefits to Colombia including: direct employment, indirect employment, favorable balance of payments and national defense.
2. It appears that foreign-flag competitors (such as flags of convenience vessels) have lower labor costs than Colombian-flag vessels.
3. No reason has been found to believe that more Colombian-flag vessels will increase the amount of Colombian international trade.

TABLE 4.6

TYPES OF SHIPPING OPTIONS

No Shipping Capacity			National Shipping Capability		
a	b	c	d	e	f
				Owned Tonnage	
No control of shipping (buy c.i.f. and sell f.o.b.).	Using freight brokers or shipping agents with control over shipping arrangements, but not rates.	Shippers councils or similar organizations with control over shipping arrangements and some control or influence over rates.	Using chartered or leased tonnage.	For use in the country's foreign trade.	For use in the country's foreign trade and also in cross-trading.

SOURCE: Hansen, 1981, p. 16.

4. No reason has been found to believe that more Colombian-flag vessels are needed for defense purposes at this time.
5. There appears no pressing need for the Colombian government to spend its limited resources to expand its national-flag merchant marine at this time.

Further Research

Further research would be valuable in a number of areas to better understand and document the benefits of the Colombian-flag merchant marine and to aid comparison between investing government funds in the merchant marine versus other sectors of the Colombian economy. Key questions to be answered are listed below:

- How many Colombian citizens would be employed, directly and indirectly for each one million dollars of incremental investment made in Colombian-flag merchant vessels that would not be employed if the same investment were made in foreign-flag ships?
- What is the balance of payments impact for each incremental one million dollars invested in Colombian-flag vessels?
- What is the return on investment for each incremental one million dollars invested in Colombian-flag vessels?
- Can any national defense need be found for having more Colombian-flag vessels?
- Can any reason be found to believe that more Colombian-flag vessels will increase the total amount of Colombian international trade?
- How do the operating costs of Colombian-flag vessels compare with foreign-flag vessels? How do the operating costs of privately-owned Colombian-flag ships compare with the costs of government-owned Colombian-flag vessels?
- What are the load factors (i.e. utilization) of Colombian-flag vessels on inbound and outbound voyage legs? To what extent do Colombian-flag vessels operate in cross trades in order to obtain more cargo? To what extent do national-flag ships from the nations involved in these cross trades operate in Colombian trade routes? What are the cargo reservations policies of countries involved in these cross trades? (These questions should be answered before Colombia makes any changes in its cargo reservation policies and how they are implemented.)
- In a national emergency, what is the difference in the amount of control that the Colombian government can expect over a privately-owned Colombian-flag vessel versus a government-owned Colombian-flag ship?

II. OVERVIEW OF THE COLOMBIAN PORT AND HARBOR SECTOR

In the 1960s, Colombian ports were among the most productive in Latin America (Robayo, 1983), but slow growth rates in port capacity and the lack of significant infrastructure development have had a substantial negative impact on national port productivity.

Almost all of Colombia's foreign trade flows through the major maritime ports of Barranquilla, Buenaventura, Cartagena, Santa Marta and Tumaco (see Table 4.7). Foreign commerce, exclusive of petroleum products, reached approximately 8 million tons in 1980. In 1975, that figure was only 4.5 million tons, indicating a five-year growth rate of nearly 80%. During that five-year period, Colombian ports experienced a growth rate in commerce volume of only 10% (Grancolombiana, 1982). This figure includes the new docks at Santa Marta, Barranquilla, and Cartagena, as well as the new storehouse at Buenaventura. These low port growth rates have essentially continued to the present. However, efforts to aid this situation are now under consideration by responsible authorities. Current development plans have budgeted US\$80,000,000 for the period 1983-1987 to repair existing facilities (COLPUERTOS, 1983b).

Colombian ports are primarily owned and operated by the government, with administrative responsibilities divided between either COLPUERTOS or the Dirección General Marítima y Portuaria (DIMAR). Infrastructure investment is from the government and the major ports are run by COLPUERTOS. COLPUERTOS has the responsibility to direct, administer, exploit, conserve and monitor activities in Colombian ports, and is comprised of 1) the Principal Office and, 2) the Maritime and River Terminals. The Principal Office is responsible for the planning, scheduling, and control of national port development and for the planning and execution of investment programs. The terminals cover the planning and execution of individual port operations, for administrative and financial operations, and for maintenance of installations and equipment necessary for the normal functioning of the ports. COLPUERTOS employs approximately 5700 full-time (fijo) people and 5700 part-time (destajo) people (COLPUERTOS, 1983b).

TABLE 4.7
MOVEMENT OF CARGO THROUGH COLOMBIAN PORTS - 1982 and 1973

	1982	1973	1982	1973	1982	1973	1982	1973
	Total ^a	%	Imports	%	Exports	%		
Buenaventura	4,794,272	57.2	1,914,754	48.2	777,595	38.5	63.7	55.2
Barranquilla	1,167,360	13.9	622,658	14.9	40,042	17.6	3.3	13.5
Cartagena	1,260,943	15.1	543,675	14.7	122,304	19.7	10.0	8.2
Santa Marta	1,158,782	13.8	360,793	21.2	252,294	24.2	22.0	17.4
Tumaco	1,130	-	-	-	-	-	-	-

^a Figures are presented in tons

SOURCE: COLPUERTOS, 1983c.

DIMAR's responsibilities include the management of the merchant marine, marine scientific research, and the regulation and control of international marine transportation and cabotage, including the country's ports. Among its principal functions are to implement government policy on maritime and port activities in its jurisdiction, to participate in the establishment of norms on the merchant marine, to aid in the development of the maritime sector through the planning and coordination of port services and internal transportation.

There are also privately-held specialized docks in Colombia, including 13 in Cartagena, 10 in Barranquilla and a small number in Tumaco. These docks are authorized by DIMAR and are supervised by the COLPUERTOS Office of Private Docks. Investment and administration in these facilities is private. They are designed to meet special needs within the Colombian economy, and process approximately two-thirds of the export and one-sixth of the import trade (See Table 4.8).

A. Diagnostic Focus

This discussion of Colombian port development and management addresses three principal areas: (1) Port Administration and Management; (2) Cargo Handling and Storage; and (3) National Transportation Systems.

The first section focuses on those port administration and management issues that are most relevant to the current Colombian situation. This includes port management training, interaction between concerned actors, and competition and port specialization.

The second section addresses the key question of cargo handling and storage. Given the Colombian situation, this discussion is focused on questions relating to port installations and equipment, labor costs and practices, port security, and the potential for containerization.

The final section elaborates on the importance of viewing port and harbor development within the larger context of a national transportation network.

TABLE 4.8
MOVEMENT OF MARITIME COMMERCE

COLPUERTOS Ports			Private Docks	
Year	Imports ^a	Exports	Imports	Exports
1970	1,655,848 (86.5) ^b	942,984 (16.0)	257,602 (13.5)	4,941,347 (84.0)
1971	1,788,605 (79.7)	920,234 (16.1)	456,601 (20.3)	4,804,512 (83.9)
1972	1,525,257 (79.1)	1,126,394 (22.9)	403,504 (20.9)	3,783,595 (77.1)
1973	2,033,817 (80.5)	1,034,547 (25.0)	493,225 (19.5)	3,097,686 (75.0)
1974	2,130,401 (82.1)	1,015,440 (33.3)	464,152 (17.9)	2,037,328 (66.7)
1975	1,566,038 (75.9)	1,297,818 (41.7)	496,343 (24.1)	1,814,961 (58.3)
1976	1,718,143 (56.4)	977,782 (33.4)	1,328,996 (43.6)	1,953,826 (66.6)
1977	2,799,487 (72.7)	700,725 (28.8)	1,051,204 (27.3)	1,732,210 (71.2)
1978	2,618,391 (73.1)	1,189,175 (32.7)	936,644 (26.9)	2,442,426 (67.3)
1979	2,641,574 (83.3)	1,251,618 (35.6)	529,493 (16.7)	2,261,936 (64.4)

^a Figures are presented in tons

^b Figures within parentheses are percentages

SOURCE: CUTMA, 1980.

B. Port Administration and Management

Port investment, administration, and operation are all dominated by the public sector in Colombia. While other nations have adopted different public/private sector mixes in port development, studies have shown few differences in overall port efficiency that can be directly attributed to the structure of ownership and control. Effective management is not limited to either the public or private sector. The present study, therefore, assumes that the peculiarities of the Colombian administrative and operational system do not preclude consideration of management alternatives shown to be effective in other regions.

Port Management Training

Effective management and investment capital can be equally critical resources restricting improvements in port performance, therefore, it is important to future port development that manpower constraints are minimized. This implies a need for the training and retraining of management--a policy which constitutes an essential and low-risk investment for ports.

Inefficient administrative procedures may contribute to the low level of productivity in Colombian ports. A concern has been raised that administrative procedures have not reflected changes in port operation (CUTMA, 1982). Although it is beyond the scope of our study to offer a detailed evaluation of port operating procedures, it is apparent that enhanced training of Colombian port personnel, particularly mid-level management, could provide substantial opportunities for future improvement.

The only education and training for many managers in Latin America has been that conducted by the navy for military purposes. There has been an assumption that administrative skills are transferable from naval to commercial shipping. This is, however, only partially true. Owing to the complexities of an expanded and modernized shipping fleet in many Latin American countries, and to the increased importance of efficient ports in

their economies, there is a greater reliance on specialists in the maritime field. In the last few years, there has been increased interest in the training of managers specifically for commercial shipping and commercial ports. So far, there are no institutes in the region specifically devoted to ports and shipping courses, but maritime-related courses have recently been introduced into several curricula in some Latin American universities--the University of Rio de Janeiro, University of Buenos Aires, Catholic University of Valparaiso, and University of Lima (UNCTAD, 1980).

If it is not feasible for Colombia to develop an independent national maritime training facility at this time, it may be possible to take greater advantage of existing United Nations sponsored port management training. The United Nations Conference on Trade and Development (UNCTAD) has been involved in maritime transport training courses since 1971. Since that time the Shipping Division, and particularly the Ports Section, has developed a series of training courses and short specialized seminars. Much of the material presented in these courses is generally applicable to the problems faced by Colombian port managers.

Port Rivalry, Cooperation, and Specialization

Port rivalry and competition have been a problem in both the developed and developing world. There have been many instances in which cooperation and specialization have mitigated such problems and have increased individual port efficiency and economic return. Some examples from the United States are illustrative. In the case of Houston and Galveston, a ship loading in the first port has the option, at virtually no additional cost, of fueling, provisioning, repairing or loading additional cargo at the second port (Fleming, 1983). In Seattle and Tacoma, steamship lines operating in one port can easily visit ships and cargos in the other. So can freight forwarders, customs-house brokers, pilots, tugs, and ship chandlers. These two ports have taken advantage of other opportunities for mutual benefit, such as Tacoma's expansion of space relieving the pressure for Seattle waterfront space, or Seattle's elaborate marketing, data-handling and control systems serving Tacoma port users' needs (Fleming, 1983). Such arrangements help to reduce needless duplications and waste. Because Colombian ports have a shared set of

interests in regional and national growth, employment, and industrial competitiveness, further study into greater port specialization and cooperation could lead to substantial and long-term economic benefits for the country.

Port Security

Most ports in the world suffer from the problem of material loss by theft. This is a problem of long-standing nature and tends to be worse when cargo is stored for long periods of time in port. In Colombia, the introduction of port police helped to cut those losses for a time, but apparently, there has been a recent increase. Beyond modifications in security measures, it is probable that losses will decrease as port cargo storage time also decreases. This latter point will be discussed in a subsequent section.

Interaction with Other Concerned Actors

Because the efficiency of a nation's maritime transport system has such far-reaching economic impact, it is incumbent on a rational planning system to insure that a broad range of interests are heard in the plan development process. While there have been recent efforts to meet these needs, substantial problems continue to exist. Interviews conducted by WHOI researchers during the spring of 1983 revealed that COLPUERTOS officials did not appear to know of INDERENA's plans to make Buenaventura a major fishing port. This point illustrates rather well the need for greater interagency cooperation. Further, reports prepared by Grancolombiana reference the need for COLPUERTOS to take into account the needs and recommendations of outside users to a greater degree (Grancolombiana, 1983). The need for effective coordination between port management and customs operations is also of vital interest. Because port interests in Colombia include a complicated network of public and private interests the problem is a complex one. However, to avoid the issue because of its complexity can introduce costly consequences.

C. Cargo Handling and Storage

Cargo handling and storage data provide the most easily quantifiable measure of a port's efficiency.

Port Installations and Equipment

The difference in growth between foreign trade and port development observed in Colombia has caused several problems. Port congestion affects the efficient movement of goods while increasing the cost of both import and export products. Besides the actual handling of the cargo, which is an important element in the calculation of cost, a second critical item is the period the vessel remains in port, i.e. the cost of its immobilization (Suykens, 1983). Shippers are faced with increasing costs, and to a degree, the ability of Colombian business to respond to changing external market conditions is also affected. Planned expenditures by COLPUERTOS for the rehabilitation of existing facilities and for the acquisition of new equipment are designed to offer a short-term solution to these problems. With other plans to increase rotation rates and productivity, COLPUERTOS hopes to expand the usable capacity of Colombian ports by 15%--a figure that would meet projected needs to the year 1990 (COLPUERTOS, 1983). However, these short-term solutions are not, and are not designed to be, sufficient for the longer-term development of the Colombian economy. Because of the dynamic nature of port technology development, it is incumbent on planners to anticipate the introduction of innovations that could give Colombia a relative technical advantage over other countries in the region.

Cost of Labor in Port Operation

Along with considerations of physical infrastructure, questions of overall transportation efficiency and costs hinge solidly on the cost and efficiency of labor operations. Much has been written about the high cost of labor in Colombian ports (COLPUERTOS, 1983a; CUTMA, 1982; Grancolombiana, 1982). High wages, extended family benefits, and inefficient labor practices all contribute to the fact that Colombian port labor costs are among the highest in Latin America.

Planning the introduction of container terminals to replace break-bulk cargo facilities (or the introduction of other technical advances) requires a re-evaluation of existing labor rules and practices. For example, if labor wages are tied directly to tons of cargo handled, it makes little sense to move cargo ten times faster with container cranes if labor wages will rise by a factor of ten. On the other hand, labor will argue that they deserve to share in some of the benefits resulting from modern container technology. In the United States container facilities are utilized with two different types of labor agreements. On the Atlantic and Gulf coasts, longshoremen receive a guaranteed annual income (of an agreed-upon number of hours) whether they work or not. On the Pacific coast the shipping companies pay a sum of money each year directly to the longshoremen union's pension fund. In return, flexible labor rules exist in Pacific coast container terminals.

The Containerization of Colombian Ports

The expansion of Colombian container capability is an area that has been given a good deal of scrutiny. La Flota Mercante Grancolombiana has referred to the "unpostponable necessity that Colombian ports be adequate for the handling of container and for the operation of roll-on roll-off vessels" (Grancolombiana, 1982). The question of containerization has been the subject of several past studies, including one by Alay-Lyon (1981). The Lyon study concluded that if Colombia enlarged one of the Atlantic ports and Buenaventura, and adapted them for containers, Colombia could serve as a major transshipment point for all of Latin America.

Since the 1980 submission of that report, however, Venezuela, Panama and Ecuador have built their own container ports. While it is not entirely clear what impact these new facilities have on the potential for the containerization of Colombian ports, some general concerns can be identified. Two factors will play a prominent role. The first relates to economies of scale. De Neufville and Tsunokawa (1981) have concluded that container ports do, in fact, exhibit substantial economies of scale. Even though no effort is made in our study to quantify this factor, it can be said that the "minimum efficient scale" for container ports is relatively large as compared to the

size of most maritime ports. The suggestion made by De Neufville and Tsunokawa is that investments made in larger ports are much more economically advantageous than those in smaller regional container ports. How the introduction of other large container ports within the Andean region would affect calculations of the economic efficiency of new Colombian container facilities is a subject worthy of continued study.

A second important factor for decisions about capacity augmentation relates to the adequacy of the overall transportation network to carry containerized cargo efficiently. This point was raised by COLPUERTOS in its "Formulación del Plan de Desarrollo: 1983-1986." In that document it is suggested that

Containerized transportation is not exclusively related to the development of ports, but adequate handling must be available at all transfer points, which means that container ports should have their counterpart in the interior of the country.

The point is an important one. The farther a container load can pass through the distribution system before being broken down into its component packages, the greater the economic benefits will be. The advantage of a box system can be lost unless there is maximum "penetration" toward final markets. The introduction of container port facilities could prove fruitless if the rest of the transportation network is not capable of efficiently handling their throughput. This aspect of the port containerization equation would also seem to warrant more careful scrutiny.

D. National Transportation System

Economic historians have said that physical distribution, that is, the transport, storage and distribution of goods, remained for many years the last weak link in the chain of the entire economic cycle (Suykens, 1983). While that situation has substantially improved in many countries, the degree to which the same can be said for Colombia is unclear. Within this framework, the chain of transport is viewed as a

whole. This means that the transport of cargo by seagoing vessels is not viewed separately from its handling in the seaport and subsequent transport into the interior. Viewed in this context, the storage function of seaports takes on added significance.

The design, development, and maintenance of a multimodal transport system connecting ports with major inland markets can be an important, if not critical, component to a national transportation system. In Colombia's case, at least three transport options exist and could be considered in the development of future port/national transportation plans. These are road, rail, and river transport. Rail transport is most efficient for long-distance, high-volume or high-weight consignments. In the past, railways have attracted bulk commodities on long hauls and have also been used successfully for transport of containers. Road transport is a more flexible system by which smaller loads carried over shorter distances can be more conveniently handled. As with rail transport, river (barge) transport is most suitable for the carriage of large volumes over long distances, when delivery speed is not critical, so that decreasing costs per transport-mile are realized.

The ability to transport goods at high speeds has usually ensured the dominance of road and rail in the inland distribution of goods. However, rising fuel costs are beginning to alter inland-haulage structures with the effect that speed is no longer as decisive a factor in efficient transportation. If this trend continues, it would be comparatively favorable for rail and--above all--for inland waterway transport. It is, in any case, most useful to compare costs and other elements of transport performance to find the best form of combined transport for integration with future port and harbor developments.

E. Overall Diagnostic Observations on Port Development

Several points should be made in summary.

1. Short-term planning which emphasizes improvements and repairs of existing structures and long-term planning which incorporates port

modernization and equipment upgrading are complementary components of plan development.

2. In an era of rapid technological advance, the appropriateness of the status quo in port labor practices is an area deserving ongoing evaluation.

3. Because questions of port infrastructure and labor cost are more easily quantifiable, there is a tendency to stress them in port planning. However, an efficient, well-trained port administration (one that accurately reflects changes in port practice brought about by advances in technology) is also critical to plan development.

4. The integration of port planning with other national transportation plans is of great importance. Isolating port development planning from other transportation concerns will invariably limit the overall effectiveness of marine transportation.

E. Overall Diagnostic Observations on Port Development

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CHAPTER 5

TOURISM AND COASTAL DEVELOPMENT

Robert W. Knecht

A. Introduction

In the last decade, tourism has played an increasingly important role in the economy of Colombia, especially as a generator of foreign earnings. Coastal tourism, estimated roughly at about 1/3 of total tourism as measured by location and numbers of hotel rooms and jobs, figures prominently in government plans to increase still further the contribution of international tourism to the foreign exchange balance of the country. In the near term, expansion of coastal tourism will necessarily come primarily along the Atlantic coast and on Colombia's Caribbean islands, given the existing transportation network, identified sites with tourism potential, and the relative proximity to tourism markets in North America. While the Pacific coast also has the potential for some forms of tourism (especially the "wanderlust" or adventure type), the lack of basic infrastructure will probably limit the near-term development to one or two presently accessible areas.

The purposes of this chapter are three-fold:

- To put in perspective the present contribution of tourism (and, where possible, coastal tourism) to the Colombian economy;
- To review present government tourism policies and programs in relationship to the goals and objectives that the government hopes to meet;
- To diagnose the existing situation in Colombia with emphasis on the inter-relationship between coastal tourism and other coastal development.

This chapter first outlines global and regional trends in tourism. Next, tourism and coastal development in Colombia are discussed and existing

government policies and programs are reviewed. Finally, the present situation is analyzed and recommendations concerning both coastal tourism and coastal zone planning and management are offered. It should be noted at the onset that the analysis has been somewhat hampered by the lack of detailed data, as Colombian agencies do not include an explicitly coastal component in their data collection schemes.

B. Global and Regional Trends in Tourism

Tourism is becoming one of the largest single items in the world's foreign trade. It has been predicted by some futurists that tourism could become the world's biggest single industry by the end of this century (Kahn, 1976). According to World Tourism Organization statistics, international tourism involving some 300,000,000 tourists (from non-Communist countries) was responsible for expenditures of over \$120 billion in 1982. Between 1960 and the energy crises of the mid-1970s, world tourism grew at a rate of about 10% per year. Since then, a growth rate of approximately 6 to 7% per year has been observed. Despite the chilling effect of the global recession of the early 1980s, most analysts expect international tourism demand to resume and maintain the 6 to 7% growth rate for the next decade or so. During that period, developing countries, on the average, are expected to see a growth in international tourism at least in line with this growth in total demand (Cleverdon and Edwards, 1982).

These growth projections could bode well for Colombia with its favorable location, its rich cultural attractions and its attractive Atlantic coastline. The fact that Colombia is only about half the distance from U.S. population centers than Rio de Janeiro, Brazil or Santiago, Chile, is important in considering its potential share of the lucrative North American market. The chart below illustrates the relative accessibility of Colombia by showing commercial flying times between U.S. population centers and four cities in South America.

TABLE 5.1
FLYING TIME FROM MAJOR U.S. CITIES TO SOUTH AMERICAN DESTINATIONS
(in hours)

	<u>Miami</u>	<u>New York</u>	<u>Los Angeles</u>
Cartagena	2.5	5	9.5
Bogotá	3.5	5.5	9
Rio de Janeiro	7	10.5	11.5
Santiago	11	11	15

SOURCE: Eastern Airlines, Avianca and Pan American Airlines.

Such increases for Colombia would come on top of an already relatively favorable tourism situation. Whereas in 1960, less than 50,000 foreign tourists entered Colombia, that number had increased to more than 160,000 by 1970 and to over 1.2 million by 1982. By comparison, in 1982 only 1.3 million tourists visited Brazil, a country with five times the population and eight times the area. These large increases in incoming tourism to Colombia are due, in part, to the emphasis and support given to this sector by the government since 1968.

International tourist flows are influenced by economic conditions in both the country of origin and the country of destination. Studies have shown international leisure tourism to be both price and income elastic. Changes in either of the two variables normally result in more than a proportional change in such travel (Krause and Jud, 1973). Variations in other factors, such as international airfares, civil unrest, and natural disasters can also play important roles. The two year period (1979-1980) was chosen to compare the levels of international tourism in South America since this time period appears to be relatively free of influence of the 1981-1982 recession. The results were as follows:

TABLE 5.2
 NUMBER OF INTERNATIONAL ARRIVALS IN SELECTED NATIONS
 IN SOUTH AMERICA 1979-1980

Brazil	1,300,000
Colombia	1,180,000
Venezuela	920,000
Peru	350,000
Chile	300,000
Ecuador	240,000

SOURCE: International Tourism Statistics published by the World Tourism Organization.

At the present time, Colombia is second only to Brazil as an international tourist destination in South America. While South America as a whole has probably attracted less than 2% of worldwide tourist flows in recent decades, it is likely that this percentage will increase in the future. Increasing congestion and degradation at traditional resort destinations are likely to encourage more wide-ranging "sun, sea and sand" tourism. Also, a growing number of more adventurous tourists will continue to seek novel and unique settings and experiences. Also, increases in business-related travel can be expected to follow increases in international trade. South America and Africa will likely be among the regions to benefit most from these trends.

C. Tourism and Coastal Development in Colombia

Colombia's unique location--gateway to South America and only country on that continent with coasts on both the Atlantic and Pacific oceans--its substantial natural endowment, and its rich culture, give it a large potential for tourism. Indeed, tourism is already contributing a great deal to the economy of the country. Since 1978, tourism has generally been the most

important generator of foreign earnings (divisas) after exports of coffee. Table 5.3 shows the export earnings contributed by tourism and selected other sectors between 1978 and 1982. The effects of the recession can be seen in all of the earnings figures for 1981 and 1982 with the exception of petroleum.

As can be seen from Table 5.3, the contribution of tourism to total foreign earnings ranged between 10 and 15% through 1981. The poor showing in the last two years (1982 and 1983 (provisional figures)) is undoubtedly related both to the global depression and the severe economic difficulties being experienced in Venezuela and Ecuador, the bordering countries which typically provide between 70 and 80% of Colombia's foreign tourists. When closer to normal economic conditions return in Venezuela and Ecuador, tourism earnings ought to return to a level that represents at least 10% of the country's total export earnings (goods and services). In interpreting the export earnings figures for both tourism and petroleum, however, an additional factor should be considered. In both cases, substantial imports are involved which tend to offset the positive effects of the export earnings. In the case of tourism, the spending by Colombians when they travel outside of the country is the economic equivalent of spending for imported goods. While the tourism balance (the difference between tourism earnings and spending by Colombians abroad) was apparently as large as \$390 million for the year 1981 according to the Corporación Nacional de Turismo (CNT) (Plan Maestro, 1983), in 1982 the balance decreased to substantially under \$100 million (DNP, 1983). For petroleum, more expensive hydrocarbon products are being imported than are being exported; hence, while the situation is slowly improving, the balance remains negative (\$315 million more was spent to import petroleum products and crude oil than was earned through petroleum exports in 1982).

An additional factor is involved in interpreting the foreign exchange earnings from tourism. Typically, substantial amounts of goods and services are imported in connection with both the construction and the continuing operation of new tourist facilities, such as resort hotels. The value of these tourism-triggered imports, together with overseas promotional costs, also have to be subtracted from gross tourism earnings to correctly estimate the economic impact of international tourism on the foreign earnings balance. In countries with open-ended economies such as Barbados, this "leakage" can

TABLE 5.3

EXPORT EARNINGS IN COLOMBIA

	/ 1978	/ 1979	/ 1980	/ 1981	/ 1982
Coffee	2000 ^a (56.7) ^b	2025 (45.0)	2400 (45.6)	1394 (29.9)	1615 (39.9)
Tourism	474 (13.4)	699 (15.5)	666 (12.7)	492 (10.6)	214 (05.3)
Petroleum	155 (4.3)	205 (4.5)	310 (5.8)	336 (7.2)	349 (8.6)
Textiles	195 (5.5)	150 (3.3)	167 (3.2)	134 (2.9)	146 (3.6)
Sugar	20 (0.57)	50 (1.1)	175 (3.3)	74 (1.6)	50 (1.2)
Total goods	2569	3044	3394	2926	2732
Total services	960	1453	1864	1735	1317
TOTAL	3259	4497	5258	4661	4049

a. Export earnings given in millions of U.S. dollars.

b. Number in parentheses is percentage of total annual earnings from goods and services combined.

SOURCE: Interamerican Development Bank for all earnings figures except petroleum; for petroleum, ECOPETROL, Report to Sasaima Workshop, June 1983.

amount to as much as 42% of tourism earnings (Chernick, 1976). It is assumed that Colombia has a continuing program to reduce this leakage through the substitution of local products and services for such imports.

Tourism is also an important generator of employment in Colombia. The sector employed 46,166 people in 1980, or approximately 1% of the economically active population (DNP, 1983). Between 1976 and 1980, the number of tourism-related jobs increased by 35%; only in the petroleum-related sector, was the increase slightly larger (38%) but that sector employed only about 10,000 people in 1980. An early study by the World Bank on the tourism potential of Colombia estimated that, on the average, two jobs are associated with each resort-type hotel room.* Considering indirect employment, it appears that a new job is generated in the tourist sector for each \$1,000 to \$4,000 invested (in 1973 dollars) (World Bank, n.d.).

Clearly, the Atlantic coast plays an important role in tourism in Colombia. Cartagena and Santa Marta have become major tourist destinations for both international and domestic tourists. Tourist flows also continue to increase to the islands of San Andrés and Providencia. It would appear, based on the number of hotel rooms and related facilities, that about one-third of the nation's tourism activity is centered in this region. In 1981, 30.8% of government credits granted by CNT for tourism facilities went to the Atlantic coast and the island of San Andrés (a total of 143.6 million pesos, or about 3 million dollars at the 1981 exchange rate). The attractions of the Atlantic coast center on both the natural environment -- the beaches, coral reefs, lagoons, and clear warm waters of the Atlantic Ocean and Caribbean Sea -- and the remarkable Spanish culture and colonial architecture found in some of the cities of the region, most notably Cartagena. But tourism is by no means the only economic activity found along the Colombian Atlantic coast. In fact, even in Cartagena, the center for Atlantic coast tourism, it is unlikely that jobs associated with the 40 or so resort hotels and the restaurants and other tourist facilities and activities are as numerous as those in the port and the industrial sectors.

*In 1982, there were 26,577 hotel rooms in Colombia (CNT statistics).

Coastal tourism, given its high dependence on the quality of the environment, can be significantly affected by other developments occurring in nearby coastal areas. The air, water, noise, and visual pollution often associated with industrial areas can have a very deleterious effect on tourism. In assessing the prospects for expanded coastal tourism, therefore, one must look not only at potentially attractive sites for further development and at potential markets, but also at the other kinds of development occurring (and planned) in the area.

The Atlantic coast is the site of three of Colombia's major ports. These ports, situated at Cartagena, Santa Marta, and Barranquilla, play a key role in coffee exports and the exports of other agricultural products as well. Fishing fleets and their support facilities, both industrial and artisanal, are based in these cities and other smaller communities along the coast. The Cartagena and Barranquilla areas contain major industrial facilities, many of them located to take advantage of marine transportation for incoming raw materials and outgoing products. A substantial volume of energy-related activity is also present in the Cartagena area, as are major ship construction and repair facilities and currently a major project is underway to construct a very large coal port at Portete (about 200 km. north-east of Santa Marta) to serve as shipping point for the coal produced by the massive El Cerrejón project.

At present, the vast majority of Colombia's coastal tourism takes place on the Atlantic coast and on the offshore islands of San Andrés or Providencia (about 7,500 hotel rooms on the Atlantic coast; and 1,600 rooms on San Andrés and Providencia). Colombia's Pacific coast is approximately as long as the Atlantic coast but is virtually undeveloped. Difficulties in access, lack of good harbors, inadequate infrastructure, and unfavorable climatic conditions have greatly slowed development there. Although some limited visitor facilities are available in Buenaventura and Tumaco, these are used largely by people coming to these areas in connection with port-related businesses rather than for leisure activities. While the potential for coastal resort-oriented tourism in the vicinity of Buenaventura is large due to the presence of good beaches at Juanchaco and elsewhere and the relatively easy access via Cali, difficulties with land assembly and financing have, to date, reportedly

hampered such development. Given that it is the closest coastal area to the large population centers in the southern half of the country, especially Bogotá, development of this asset to meet domestic tourism needs would seem highly desirable.

D. Government Policies and Programs

The government tourism program is administered by the national tourist organization--the Corporación Nacional de Turismo (CNT)--and is guided by a national tourist development plan. The overall objective of the plan is to develop both foreign and domestic tourism by increasing the supply of facilities and attractions. The specific objectives of the plan are given in a report presented to the Sasaima Workshop by CNT in June, 1983. Key aspects of these objectives are summarized below.

Development of Foreign Tourism

The benefits of foreign tourism are directly related to the number of tourists who visit the country, the amounts they spend and the length of their stays. Total spending is, of course, a major factor in generating foreign currency. One goal of the plan, therefore, is to increase foreign tourism in order to increase both foreign currency received and tax income, which will lead to better infrastructure and increased economic activity.

Border Tourism

Tourism flows along the borders deserve special treatment because they differ from other international tourism. Among other things, average spending for these tourists is lower although their volume in numbers is much higher. The general goal, therefore, is to increase average spending of border tourists in order to generate more foreign currency.

Development of Excursion Tourism

Excursion tourism is seen as a way to increase length of stays, especially in areas having a number of different types of attractions, such as the coastal areas of the Atlantic and Caribbean. Therefore, it is to be given additional emphasis.

Development of Domestic Tourism

Domestic tourism has not achieved planned levels, making it now an important focus of the national tourist development plan. The plan's objectives include obtaining greater economic, social, and regional benefits from domestic tourism, which also strengthens national identity, facilitates

access to culture, history, and geography, and enhances awareness of culture and nature in each region of the country.

Development of Social Tourism

Social tourism is a type of domestic tourism directed toward lower income groups. This type of tourism provides individuals with opportunities to use time off constructively, promotes awareness of the country, strengthens the family unit and allows the use of underutilized tourist resources.

Development of Tourist Facilities

The development of facilities to better exploit existing attractions and to make new attractions more accessible, will occur and will be based on the growth of tourist flows in particular regions.

CNT also gives the following six justifications for government support of tourism development:

- 1) Produces Foreign Currency - Tourism contributes to economic equilibrium, as the receiving states generally have a negative balance of payments and low per capita income, while countries generating visitors have a stable balance of payments and high per capita income.
- 2) Generates Jobs and Redistributes Income - Growth in tourist demand, both domestic and foreign, generates an increased need for services and consequently an increase in the number of jobs.
- 3) Assists Regional Development - Tourism contributes decisively to the economic and social development of the area in which it is located. It encourages financial investment (both public and private) which enhances the region's attractions without altering the ecology; it also redistributes income among regions, promotes primary sector production and development in general.
- 4) Assists Depressed Regions - Tourism in regions developing more slowly contributes notably to increased development by encouraging the government to build infrastructure which, in turn, promotes private investment in tourism and in other developmental activities.
- 5) Generates Government Income - Taxes on tourist activities contribute to the income of government.
- 6) Strengthens National Identity - Tourism, through the promotion and "sale" of intangibles such as cultural, scenic and natural values, permits nationals as well as foreigners to become aware of the nation's cultural heritage, thus strengthening national identity.

The national tourist development plan contains specific policies in eight areas: Financial Assistance, Research, Construction and Maintenance of Facilities, Commercialization, International, Environmental, Training, and

Immigration and Customs. Of most relevance to the present study are the policies concerned with financial assistance, research, and the environment.

Financial Assistance Policies

CNT is empowered to seek and encourage investment in priority regions and in other long-range development areas, as well as to find local partners for joint venture projects proposed by foreign investors. CNT also channels government financial support towards necessary non-profit activities such as preserving historic sites, improving public recreation areas, training service personnel and providing qualified technical and managerial talent. The government's financial assistance is in the form of credits, loans, and tourist development certificates. Direct credits and loans, supported by a government tax on tourism, are given to help finance the construction of new hotels and related facilities, and, more recently, to assist travel agencies in developing and offering package tours to promote international tourism. Current policy calls for using no less than 60% of the funds collected from tourism taxes for the purposes of extending credit to needed projects.

A second form of financial assistance involves tourist development certificates. These certificates can be used by foreign investors to help pay national taxes during the initial period of operation of new facilities (up to 10 years). The current national tourist development plan calls for the use of this financial assistance to aid the industry in maintaining high quality standards in the construction of new facilities and the improvements of existing ones, to prevent the deterioration of facilities, and to protect natural resources which, in themselves, are important tourist attractions. Present policy also calls for giving priority to geographical areas which can meet specialized tourist demands (i.e., tourist areas near borders which, when improved, would help prolong the stays and increase the spending of tourists from neighboring countries). CNT also intends to direct some of its investment funds in such a way as to orient and encourage certain types of private investments. CNT will join with local groups ("Societies") in order to undertake selected regional projects. Special studies will involve the incorporation of aspects of the nation's cultural heritage such as national monuments, historic zones, museums, etc., into the fabric of national tourism.

Research Policy

Studies will emphasize the supply and demand aspects of tourism in today's market. The changing demand of international tourism will be analyzed as will the trends in tourist flows and potential targets for promotional campaigns outside of the country. The supply side of the study will include analyses of economic and physical factors as well as the present and potential supply of tourism attractions. The goal of these studies will be to permit adoption of appropriate financing, price, promotion and marketing policies and to set established guidelines within which the private sector will operate. From a physical standpoint, it is intended to divide the country into regions for planning purposes with the goal of tailoring marketing policies to the special characteristics of each region and creating a program of specialized tourism for each.

Environmental Policy

In the Sasaima report, emphasis is given to coordination with INDERENA concerning the use of some national parks and natural areas for "scientific tourism." The use of such areas for tourism would be strictly controlled and limited. The principal legal device available to CNT to protect environmentally sensitive areas with tourism potential is contained in decree number 575 of 1972 which gives CNT legal authority to create several types of tourist zones, including a Tourist Reserve Zone. These are areas of potential tourism development, but where development is not foreseen in the immediate future. Special conservation and management plans are needed before permission to proceed with specific development is granted. Several other types of zones are available to CNT to protect culturally important buildings, monuments, museums, and special areas adjacent to important transportation routes. A number of Tourist Reserve Zones were established along the Atlantic coast shortly after the legal authority became available.

Colombia's immediate goals in the tourism sector were recently set out by President Belisario Betancur in his government's National Development Plan, 1983-1986 (DNP, 1982). They can be summarized as follows:

- International, domestic and social tourism will be stimulated. The first is valuable as a source of foreign currency and employment; it is hoped that it will come to represent at least a 10% contribution to the exchange balance (it represented 5% in 1982). As for the second, the goal is to include 20% of the Colombian population by 1985 (13.5% of Colombians were domestic tourists in 1982).
- A tourist information and market research system will be created along with promotion and information mechanisms both domestically and abroad.
- Tourism will be encouraged in regions which have been developing slowly socio-economically. It will also be promoted along border areas and in five large "circuits": Sur Occidente, Amazonia, Llanos Orientales, Nor Oriente and Caribe.
- With financing from PROEXPO (the export development agency), a plan to promote Colombia abroad will be implemented and immigration formalities will be updated and made more rapid.

In summary, for the last fifteen years or so, the Colombian government has recognized that tourism can play an important role in the economic and social development of the country. Programs have been developed to promote Colombia in foreign tourist markets and financial assistance has been made available to both domestic and foreign firms in connection with new and improved tourism facilities. While a significant amount of government financial aid has gone toward the improvement of facilities along the Atlantic coast and on the islands of San Andrés and Providencia and some early zoning to protect future tourist sites was undertaken, no specific programs aimed particularly at enhancing coastal tourism appear to have been developed.

E. Diagnosis of the Current Situation

Potential for Increased International Tourism to Colombia

The observations and inferences made below are drawn from the review of a number of source documents including international tourism statistics from the World Tourism Organization, and reference texts such as Robinson's A Geography of Tourism (1976), and Cleverdon and Edwards' International Tourism to 1990 (1982). However, differences in definitions, reporting periods and other vagaries often present in tourism statistics probably make these figures inherently more approximate than others in this report.

1. South America's Share of World Tourist Flows will Increase. South America's present share of world tourism (international) is probably between 1.5 and 2%. As mentioned earlier, this will almost certainly increase as the diffusion of tourism into less developed parts of the world continues. Brazil alone has set a near-term target of securing 1.5% of the international market (equivalent to 4.5 million visitors per year).

2. Colombia Should be able to Obtain an Increasing Share of International Tourism in South America. In 1970, Colombia received about 20% of the international visitors to the continent. Today, the percentage received by Colombia has probably increased to at least 25% and perhaps as high as 30%. There appears to be no reason why Colombia could not increase still further its continent share given that its rate of growth in tourism approximates that of the leader, Brazil, and that its markets should be fully as productive as those of its large southeastern neighbor, considering especially the rapidly growing Japanese market.

3. Colombia Should be able to Obtain an Increasing Share of Resort Tourism to the Caribbean. In 1970, Colombia's Atlantic coast and Caribbean resorts attracted only 1.3% of the total number of foreign visitors to the Caribbean ("Colombia", Bank of London R., 1973). In 1980, about 300,000 Americans vacationed on the Caribbean islands of Barbados and Jamaica and probably an equal number visited the smaller islands of the Antilles. Yet fewer than 30,000 Americans visited Colombian Caribbean destinations during

the same period. At present, Colombia probably receives less than 5% of the U.S. "sun, sea, and sand" trade destined for Caribbean resorts. Of the total international tourist arrivals in the Caribbean region, Colombia's current share could well be even less than 5% (Chernick, 1976).

These observations suggest that the markets exist to provide for a continuing growth in international tourism to Colombia. To develop these markets and realize the economic benefits associated with them, Colombian tourist offerings will have to be able to compete successfully with those offered by alternate destinations. For resort tourism, this competition will involve such aspects as physical attributes (dependability of sun and climate, attractiveness of sand and sea), price, and adequacy of facilities. For the North American market, of course, the principal competition will continue to be provided by Mexico and the closer Caribbean resorts. The remainder of this chapter will be devoted to a discussion of the factors that will affect the role that coastal tourism can play in making Colombia the kind of attractive tourist destination that the government seeks.

Potential for Increased Coastal Tourism

The two coastal regions of Colombia (Atlantic and Pacific) and the offshore islands of San Andrés and Providencia must be considered among Colombia's prime natural tourist attractions. The majority of the world's resort-oriented international tourists still seek reliable sunshine, warm seas and clean sand at their holiday destinations. Clearly, the further development of the Atlantic coast and the offshore islands will be an important near-term factor in increasing international tourism flows to Colombia. A recent report on coastal tourism prepared by the United Nations Environment Program (UNEP, 1982) cogently describes the important relationship between the environment and tourism in general and coastal tourism in particular.

Tourism depends heavily on an authentic socio-cultural environment and on an unspoiled natural environment. In many development activities, some degree of environmental quality can be traded in return for expected benefits in other categories, but in the case of tourism it is essential that quality be maintained at the highest possible level. Revenues from tourism (often badly needed foreign currencies) can provide communities with the funds for projects which will enhance the environment in such a

way that it will provide positive returns indefinitely. Haphazard development of areas which are tourist attractions can lead in the long term to the destruction of the very characteristics which make them attractive, and cause the permanent destruction of a potentially lucrative natural resource. The environment is the basic resource of tourism; careful exploitation of this resource can lead to its enhancement rather than its destruction.

Coastal tourism must be developed with particular care for a number of reasons, not the least of which are the complex ecosystems characteristic of the meeting of the sea, land and air, and their potentially conflicting uses. The proximity of the sea in coastal areas has led to their peculiar multi-faceted development. Climates in coastal regions are usually more moderate than those of continental interiors, and are associated with sufficient rainfall to support agriculture.

Biologically, coastal waters are more productive than the ocean depths, and supply 90% of the world's fisheries catch. Approximately 18% of the world's current oil production comes from offshore drilling and it is estimated that 68% of the world's ultimate recoverable hydrocarbon resources lie in coastal waters. Sea trade and the requirement for adequate port facilities have led to large scale urban development, including industrial development, around areas providing suitable harbors.

Coastal areas are therefore complex zones with a number of potentially conflicting uses. The decision-maker must determine which use will provide the greatest net social benefit to the community: preserving the natural environment to encourage tourism must be compared with the benefits to be obtained from conventional forms of development (industrialization and trade) with potential for environmental degradation.

By regarding coastal tourism development in the widest possible socio-economic context, it should be possible to: a) identify the resources and areas suitable for tourism development; b) enhance these resources with the minimum possible impact on alternative forms of development; and c) promote tourism in harmony with its natural resource base.

In effect, the UNEP report is calling for a kind of comprehensive coastal planning and management scheme in areas where coastal development, including tourism development, is occurring. Within the last decade and one half, specialized coastal planning and management efforts have begun in a number of countries, including the United States, France, Great Britain, Japan, New Zealand, and Australia. These programs have been developed in response to a growing number of conflicts between and among different classes of users of the coastal zone. Pollution associated with industrial and port activities adversely affects tourism opportunities. Industrial effluents degrade fishing and recreational potential. Private development of beachfront property denies

public access to and enjoyment of the beaches. Unfortunately, signs of coastal conflicts are now appearing along Colombia's Atlantic coast.

The largest and, in many ways, most promising tourist area--Cartagena--is beginning to suffer from visible environmental degradation. Cartagena Bay and surrounding waters are becoming contaminated with the residuals of the many industrial activities located there. Questions are beginning to be asked regarding the high-rise hotel development that continues in Cartagena and whether it is the kind of resort environment that is now sought by the traveling public. New tourism developments along the Atlantic coast appear to be occurring in spot fashion without an apparent relationship one to another and without appearing to be part of any overall regional plan. In large industrial development projects, such as the coal port project occurring at Portete, the project's relationship to the tourism potential of the region has not been an obvious element in the planning. While some natural assets of the area have been adequately protected, such as the Tayrona National Park, others, notably the Rosario coral reefs, are threatened by private development.

In general, it appears that planning for tourism has not been integrated into the other types of major development underway in the coastal region. Specifically, little evidence is available to suggest that tourism considerations have been built into the expansion plans of the major ports, new industrial development, or urban planning. Furthermore, while plans of various types are developed by agencies of the national government, cooperation between these agencies, the departments (states) and local governments seems weak or non-existent, causing some of these efforts to languish.

Given the intense competition in the international tourism market today, it seems likely that Colombia will capture and retain an increased market share only if it maintains its tourism assets and attractions (both natural and cultural) at the highest possible levels. Stories of deteriorating water quality, unpleasant hotel staffs, high prices, and helter-skelter development of uneven quality quickly circulate among travel agency networks and the more sophisticated international travelers, and are difficult to reverse even when conditions have improved. Increased commercial and industrial development is

certain to occur along the Atlantic coast of Colombia, and with it the kinds of environmental problems that are just now becoming visible could worsen. Therefore, the time appears to be right to consider the creation of a process in Colombia to better coordinate the planning and development of the Atlantic coastal region. While tourism might be the principal long term beneficiary of such a process, all uses and users of the coastal zone (maritime, industrial, residential, urban), will experience positive benefits from a properly designed program. Such a process can also serve as a forerunner for the creation of similar programs in the Pacific coastal region when development pressures warrant such efforts there.

To be successful, a coastal zone management (CZM) approach would have to be carefully tailored to the unique situation found in Colombia. The technical aspects of the program would have to take account of the specific physical, social, and economic conditions found along the various portions of the Colombian coast. The desert-like conditions along the coast of Guajira are in sharp contrast to the jungle-like environment found along portions of the Pacific coast. Similarly, the legal and institutional framework of such a program would have to be shaped to fit the Colombian context--that of a strong centralized national government working with weaker departamentos (states) and municipios. The fact that a relatively large number of national agencies are largely autonomous also has to be taken into account in designing such a program.

It is both inappropriate and beyond the scope of this report to attempt to prescribe the details of such a CZM program for Colombia. However, it does seem useful to describe the general outlines that might be followed in creating a CZM program and to indicate how such a program could benefit both the development of coastal tourism and the management of coastal resources generally. The discussion below focuses first on the technical aspects involved in preparing a CZM plan, and then on institutional considerations.

Technical Considerations in Preparing a CZM Plan

The overall goal of coastal zone management is to obtain maximum long-term public benefits from the coastal resources of a region. The key to

the achievement of this goal is the recognition of both the "inter-connectedness" of most coastal resources and uses and the vulnerability of the ecosystems that support them. Hence, the planning and management of the coastal zone must be done in as comprehensive a fashion as possible. Another way to state the CZM goal would be as follows: "the formulation of a coastal resources management system that permits conscious and informed choices among development alternatives."

There are three major steps in developing a CZM program: 1) identification of problems and opportunities, 2) formulation of policies, and 3) development of an implementation strategy. Each will be discussed briefly below.

1) Identification of Problems and Opportunities. Obviously, to be successful, a CZM program must address the real problems and opportunities of a region. Hence, the initial task is to identify and accurately describe the existing coastal issues in the coastal area under study as well as those that are expected to develop in the future. Some of the coastal problems to be dealt with along the Atlantic coast of Colombia include problems of erosion, coastal flooding, destruction of valuable natural resources such as coral reefs and mangrove forests, lack of recreational facilities and public access, non-existent or inadequate tourism facilities, low levels of economic development, inadequate on-shore fisheries facilities, lack of fresh water, and the like. Other problems may involve the lack of long-range plans, the lack of adequate governmental authority to deal with certain types of problems, and the lack of adequate enforcement of existing regulations. It is also likely that the lack of data and information on the location and potential value of various coastal resources and the lack of adequately trained people will be problems. And it is virtually certain that lack of funds to conduct necessary research studies, to develop plans, and to undertake studies of environmental and economic impact will also be found to be problems.

Concerning opportunities, even a casual inspection of the Atlantic coast suggests that many sites exist for additional tourism development. Further increases in industrial development, stimulated in part by the coal and

natural gas resources available in the region, can be expected and those could trigger still further expansion of both the public and the specialized private ports. Further increases in agricultural output could also force expansion of port and transportation facilities. Commercial fishing could grow, creating new demands for harbor space and shoreside processing facilities, especially if a decision is made to extend the shrimp fishery to deeper waters. And eventually, aquaculturing of oysters, shrimp or other marine species could become profitable in places like Ciénaga Grande, placing spatial requirements of a new kind on the coastal zone. In terms of opportunities, the initial phase of a coastal zone management effort should include a thorough inventory of the coastal resources of the region.

In considering future alternatives for a coastal region, the basic questions to be asked, are:

How can an increased level of economic development based on the use of coastal resources be achieved without jeopardizing the economic activities that depend upon the physical attractiveness (tourism) and the biological productivity (fisheries) of the region?

and

How can this be done at a cost that is affordable to a nation hardpressed by immediate social problems of great urgency?

In the coastal region of Colombia, it is likely that the goal will be to maximize the long-term economic return from three sectors simultaneously-- fisheries, tourism, and industrial development (including port activity). The optimum combination of these activities will depend upon the economic potential for each sector (the resource base, the market, and related factors) and the impacts that the development of one sector will have on the well-being of the others. Determining the right mix of development priorities is, therefore, a crucially important aspect of the CZM process.

2) Policy Formulation. The second important step in preparing a CZM plan involves the development of a policy framework to guide private and public decisions with respect to the use and conservation of coastal zone resources. The policy framework will address the problems and opportunities delineated above. Formulation of the policy framework will involve examination of the development potential of various resources, determining the impacts

(environmental, social, economic) of such developments, estimating the costs and benefits of development alternatives, and ultimately, setting priorities for the various development possibilities.

Most CZM plans contain three major types of policies:

- Policies Related to the Management of Coastal Development.
- Policies Related to Marine Resources Development.
- Policies Related to the Protection of Natural Systems in the Coastal Zone.

The kinds of individual policies and issues usually dealt with under each major policy area are suggested below.

Management of Coastal Development

- Natural hazards policies dealing with coastal flooding, erosion, tidal action, hurricanes.
- Tourism policies dealing with hotel siting, public facilities, and related aesthetic and environmental considerations.
- Port, harbor and navigation policies dealing with the operation and modernization of ports, the operation of harbors and improvement of navigational aides.
- Industrial siting policies dealing with water dependent industry, and such other projects that require a coastal location (e.g., aquaculture).

Marine Resources Development Policies

- Fisheries development.
- Offshore petroleum development.
- Hard minerals development.
- Ocean energy sources (e.g. ocean thermal energy conversion, if proven feasible).

Natural Systems Protection Policies

- Wetlands and Mangrove Areas.
- Coral Reefs.
- Lagoons, Estuaries, Shellfish Beds.
- Beaches and Dunes.

In addition to policies for development and protection, policies are also usually needed to deal with problems of inter-governmental coordination. Such policies would encourage, facilitate, and streamline governmental permit processes and other procedures in order to ensure that fragmented decision-making of various levels of government and between different agencies at the national level does not frustrate the achievement of national coastal policy goals.

To be effective, individual coastal policies should be as specific and as concrete as possible. They should provide clear statements of what the future should hold for various portions of the region's shoreline and coastal waters. They should provide clear-cut information to all concerned as to what kinds of development will be approved, on what basis, and in what general locations. They should also indicate clearly what types of areas of the coastal zone are "off limits" for development of various kinds and which areas are candidates for "protected area" designations.

3) Implementation Strategy. A key element in CZM relates to the manner in which the coastal policies outlined above are implemented. How can the policy goals that have been developed to address the various coastal problems and opportunities actually be achieved? How can they be enforced? In principle, a wide range of implementation approaches can be used separately or in combination to achieve the three types of policy goals: protection, rational development and improved intergovernmental coordination. Some of them are listed below:

Implementation of Protection Policies

- Laws, decrees, regulations, and permits.
- Development of guidelines and standards for coastal development near sensitive natural systems.
- Tax policies giving relief for non-development in sensitive areas.
- Direct financial and technical help from the government to improve development procedures, to assist in the construction of non-polluting facilities, etc.

Implementation of Coastal Development Policies

- Laws and regulations regarding construction in hazardous areas (building prohibitions in flood hazard zones).
- Laws and regulations regarding setback distances from the tide mark to deal with eroding areas.
- Laws and regulations regarding preservation of scenic views.
- Technical assistance regarding aesthetics in the design of coastal structures.
- Laws and regulations giving priority to water-dependent uses of the coastal area.
- Infrastructure funding policies which guide development into certain areas and away from other areas.
- Laws and regulations regarding the siting of major facilities (concerning effluent discharges, aesthetics, public access to shorelines, etc.).

- Licensing and leasing schemes for shore, land and water areas used for resource extraction purposes (oil, sand and gravel).
- Government financial support (loans, guarantees, grants) for needed shoreside support facilities (fish processing, cold storage facilities, harbor improvements).

The mix of implementation strategies will depend a great deal on the final form of the CZM program. A heavily centralized program at the national level would likely be based on the legal authority of one or more national agencies and therefore probably would involve decrees and detailed regulations. A decentralized program, on the other hand, might involve plans and guidelines developed by regional corporations, departments, or local governments following general principles laid down by the national government. In any event, the implementation strategy is usually decided upon after completion of the technical and policy aspects of the CZM plan, and is largely a legal and institutional matter and as such is described in greater detail in the next portion of the chapter.

Institutional Aspects of the CZM Plan

Invariably, a large number of agencies and several levels of government are involved in coastal zone issues and each usually guards its prerogatives. The situation in Colombia seems further complicated by the large amount of autonomy which national agencies enjoy. The absence of effective coordinating mechanisms between and among national agencies further compounds the problem. Yet, rational management of the coastal zone requires a comprehensive and integrated approach to coastal resources planning and management. Ecosystem protection, tourism and fisheries development, port and harbor planning, industrial siting all must be encompassed within the program.

Experiences in other coastal nations have shown that institutional fragmentation can be overcome if the approach used in developing a CZM plan has the following general characteristics: (1) It embraces all of the levels of government that control land and water use planning or regulation in the coastal area. In Colombia this would mean the national level, the regional level, the department level, and the municipio level; (2) While the overall policy direction, encouragement, and funding support will necessarily have to come from the national level of government, the technical work of developing

and implementing such a plan should be conducted at the lowest feasible level of government. In Colombia this could be at the regional or department level if sufficient competence and interest can be found at that level; (3) While all national agencies having control over coastal activities or developments need to be fully involved in order to ensure that their interests are incorporated into the planning process, overall direction of the effort at the national level should be lodged in a broad-based planning or coastal/ocean agency, such as the National Planning Department or DIMAR.

The institutional aspects and the timing of the CZM plan development process can be described by the sequence given below.

1) Decision to develop a coastal management program for a specific coastal region is taken at a high level of the national government, say in the President's Office or the National Planning Department.

2) A "lead" national agency is chosen to direct the plan development and implementation process. (A different agency could be chosen later to operate the program.)

3) The "lead" agency forms a CZM council of representatives from the departments and local governments in the coastal region as well as from the relevant national agencies.

4) The inter-government CZM council then assists the "lead" agency in formulating the key aspects of the CZM plan. These might include:

- The timetable for formulating the plan (2-3 years?);
- The types of encouragement, funding, and technical assistance that the national government will make available to local units;
- The manner in which the national goals and objectives are to be determined and incorporated into the plan;
- The way in which the views and needs of the coastal "user" groups, such as port and harbor authorities, industrial users, departments and municipios, will be considered;
- The ways in which the views of the public will be heard and considered.

5) Preparation of the CZM plan itself then follows, largely the work of the staffs of the planning offices of the relevant national agencies and the staffs of the regional and department levels. Within a broad framework of policies established at the national level, each subregion of the Colombian coast formulates its local goals and objectives and uses them to develop its portion of the coastal plan.

6) Upon completion and approval of the technical aspects of the plan, work begins on selecting the implementation strategies. Again, an advisory council of all affected government levels and agencies considers what combination of new laws, regulations, and other legal devices may be needed to best ensure the effective implementation of the CZM plan.

7) Upon reaching agreement on the implementation approach, the proposed CZM program (both technical and implementation aspects) is considered for official adoption by all of the levels of government that will be involved in its implementation, including most importantly, the national government.

8) A key continuing aspect of CZM is the monitoring of the operation of the program after its implementation. Are the policies of the program effective? Is improved use and protection of the coastal zone resulting from the program? Are the abuses of the past being reduced? Continuing evaluation and adjustment of the program is necessary for it to remain an effective and useful tool.

In general, when a CZM plan is in place and functioning, all proposals for development projects (industrial, ports, parks, tourism facilities, etc.) are evaluated against the set of officially adopted coastal policies that make up the CZM plan. Proposals that are consistent with the coastal policies of the plan, receive expedited governmental approval: those that are inconsistent with coastal policies of the plan are returned to the originating agency or organization for re-thinking and revision. It is important, therefore, that the coastal zone program and its coastal policies be based on sound technical and economic foundations.

This extended discourse on coastal zone management has been included in this chapter because of its long-term importance to coastal tourism in Colombia. An increasing number of development pressures are impinging upon the Atlantic coast of Colombia and unless some form of integrated planning is started soon, it is likely that diverse and uncoordinated development will begin to adversely affect the tourism potential of the region. If Colombia wants to use its coastal zones for port and harbor purposes, for increased industrial and commercial activity, for new coal shipment ports, and for increased fishing activity, and, at the same time, see increased coastal tourism in the region, a higher degree of planning and management will be required. With adequate advance planning and coordination, on the other hand, seemingly unrelated developments can actually be turned to advantage through joint planning for the location of new highways, and other forms of necessary infrastructure such as water lines, electricity, airports, and the like.

A satisfactory CZM program would encourage and support sustainable uses of the natural resources of the coastal zone while endeavoring to reduce or mitigate the adverse impacts of necessary coastal development. It is interesting to note that two of Colombia's neighbors--Ecuador and Brazil--have

coastal zone management under consideration at the present time, in both cases triggered by development pressures along portions of their shorelines.

Clearly, the preparation of coastal zone management program for the entire Atlantic and Pacific shorelines of Colombia, and the offshore islands, is a very large task. A satisfactory approach would be to divide the Colombian shoreline into a small number of planning regions, perhaps four, such as the following: the northeast Atlantic coast and islands (includes Cartagena, Barraquilla, Santa Marta, the Guajira coast and San Andrés and Providencia Islands), the southwestern Atlantic coast, the southern portion of the Pacific coast (Buenaventura and south), and the northern portion of the Pacific coast. Beginning the CZM process in the northeastern Atlantic region would address the most urgent problems first and would also serve as a trial run for the other areas.

In the case of the Pacific coast, the Plan de Desarrollo Integral para la Costa Pacífica (PLADEICOP) (DNP et al., 1983) effort has accomplished some of the initial work of CZM. The existence of this information will greatly facilitate the formulation of a CZM program for that coast. Furthermore, the CZM task there will be of a different type, given that relatively little development now exists in the region. One of the most difficult early tasks along the Pacific coast probably will involve obtaining reliable inventories of coastal resources and useful estimates of their economic potential.

F. Conclusions

An 1973 article authored by the Bank of London staff on the development of tourism in Colombia closed with the following optimistic paragraph:

"Although Colombia's tourist sector is embryonic by European standards, there nevertheless exists a real potential for tourism to become perhaps the most important growth sector in Colombia over the next 25 years. The country's geographical location in terms of proximity to important sources of tourism, its undeniable natural assets and its comparative price advantages vis-a-vis the rest of the Caribbean are factors that confirm the interest currently being shown in Europe and the U.S.A. Much work has now to be done in terms of providing the basic infrastructure and amenities, but with adequate international financing and private investment, to supplement the

Government's own efforts, economic benefits and returns are certain to accrue, particularly at a time when the Colombian economy as a whole is making satisfactory progress.

Indeed, the tourism sector has grown substantially in the decade since that prediction. But now as then, if still further gains are to be made, much work remains to be done in providing adequate infrastructure in still more locations while maintaining high quality amenities and attractive physical environments.

Shackleford (1979) has listed several conditions which will need to be fulfilled before substantial redistributions of international tourist flows from traditional destinations to new destinations in developing countries can take place:

- * The traditional markets must have reached "saturation" (the true limits of their carrying capacity both temporally and spatially);
- * Transport (almost invariably by air) must be available to the new destinations, offering sufficient capacity at competitive fares;
- * the new destinations must be politically and socially prepared for foreign tourism;
- * adequate accommodations and infrastructure must exist; and finally,
- * generating markets must be made aware of the new destinations by means of suitable promotions.

While the first item is beyond their control, the last four items clearly set out necessary agendas for developing country governments seeking to increase international tourism to their countries.

Colombia's coastal regions should figure importantly in government efforts to increase tourism, both international and domestic. Three types of international visitors can find what they seek on the Colombian coast--the "sunlust" visitor looking for a sunny resort close by the sea--the "wanderlust" visitor seeking to sightsee and understand new (to him) cultures--and the "business break" traveler extending a business trip in order to learn something about the country and, at the same time, to relax in a nice place. And the warm and sunny coastal areas will continue to be a prime destination for domestic tourists seeking a respite from the often chilly Andean highlands.

But new facilities, a higher level of integrated planning (i.e., CZM) strengthened infrastructure, and more effective environmental protection programs will be needed as visitor loads to the coastal areas grow. New tourist developments on the Atlantic coast at Baru, Pozos Colorados and the Golfo de Morrosquillo should go forward after the existing plans are adjusted to meet present standards in terms of scale, design, and physical characteristics. The beaches in and near Cartagena, while attractive, are not of world class standards; hence it seems important that locations with higher quality beach sand and clearer water be developed relatively quickly. Furthermore, large scale tourist developments such as those planned for the Golfo de Morrosquillo will not only stimulate domestic tourism but could help relieve over-taxed facilities in Cartagena and Santa Marta. Investments for improved infrastructure (fresh water, electricity) on San Andrés are necessary considering the important role that island can play in increased domestic and international tourism. New sites for future tourism development need to be found along the Atlantic coast and steps taken to ensure their protection. Indications are that coastal sites with tourism potential can be found in such locations as the Guajira peninsula at Cabo de la Vela and other points, and in the region of the Golfo de Urabá. Other possibilities exist as well.

Expanding international tourism in the Atlantic coastal region will also require much more attention to promotional efforts. In terms of the U.S. market, regular readers of the travel sections of the country's two largest newspapers (the New York Times and the Los Angeles Times) see very little on Colombia and find few, if any, organized tours or charter flights advertised. In contrast, the travel pages of these same newspapers overwhelm the prospective U.S. traveler with low cost airfares and travel "packages" to hundreds of other enticingly described locations. For example, during the week of May 14, 1984, several one-week tours to Brazil (Rio) were being advertised in the New York Times for rates as low as \$399, including roundtrip air fare from New York City and seven nights of hotel. Similar ads were seen for Aruba and Curaçao at rates between \$376 and \$459, including air fare and four to seven hotel nights. Specific inquiries to both the airlines and tour operators found that the cheapest round-trip flight available to Cartagena was \$539, with no hotel included. Unfortunately, most North Americans (and, we suspect, Europeans as well) do not have a tourism-related image of Colombia in

their minds. To the contrary, the earlier long period of civil strife, coupled with the rumors and reality of drug dealings of the recent decade, must have created a largely negative image of the country in the minds of many.*

However, the recent vigorous and well-publicized actions of President Betancur making a frontal attack on the drug problem would seem to set the stage very well for a campaign to create a new and positive image for Colombia--one that highlights the cultural values of the country, its economic growth, and its tourism attractions. Certainly Colombia's Atlantic coast, with its rich and colorful Spanish and pirate history and its natural assets, has much to offer the visitor, but the story simply is not being effectively communicated at present. Scuba diving and snorkeling are growing rapidly in popularity. Underwater tours to sunken Spanish treasure ships should have a high appeal. Similarly, excursions along the coast in reconstructed pirate ships, with stopovers for snorkeling on the coral reefs of the area, should be well received.

Concerning the need for a higher level of integrated coastal planning, we return to our point about the special nature of the coastal zone and its needs for a special kind of management. Coastal resources are, at one and the same time, valuable for many different kinds of uses--yet, exceptionally vulnerable to destruction by careless development. Already, signs of stress and the resultant degradation are being seen in Cartagena Bay and its environs. Much of the Colombian shoreline, however, remains in a near natural state, so far uncommitted to development of any kind.

In selected locations along the Atlantic coast, however, large and important economic activities other than tourism, are now under development. Along the Guajira, for example, salt and hydrocarbon production is taking place and a substantial coal port is about to begin operation. Several new industrial ports are also in operation at other locations. These projects appear to be planned and executed in relative isolation one from another and

*Sadly, a very popular film just released in the United States--"Romancing the Stone"--highlights some of these negative stereotypes.

without the benefits of integrated planning--either in a regional or functional sense. Benefits that one project could convey to another activity, say in location and design of infrastructure or support facilities, are either entirely missing or obtained by chance. Adverse impacts of today's development project on tomorrow's potential are not considered.

The difficulties seem to be related in part to the fragmented nature of the national government and the strong autonomy of many national agencies, together with a fairly weak department and local government presence. Each national agency, whether it be INDERENA, CARBOCOL, ECOPETROL, CNT, COLPUERTOS, INGEOMINAS, or DIMAR--seems to feel that it must operate more or less independently if it is to meet its assigned mission. At the same time, there seem to be few, if any, incentives for coordinating with other national agencies or with the lower levels of government, which while apparently having little real authority in land and water use decisions seem, nonetheless to be able to slow up or stop unwanted projects. The challenge, therefore, is to create an environment in which national agencies and lower levels of government see it in their interest to participate constructively in a comprehensive coastal planning and management activity. Three alternative approaches come to mind although in any given situation, an approach combining aspects of each of them could be devised:

- 1) Through compelling arguments, backed up by good descriptions of existing and worsening problems and missed opportunities, convince the various agencies that they will not be able to continue to achieve their goals, unless a higher degree of coordination and joint planning is achieved; or
- 2) Through creation of a set of new incentives, encourage a higher level of cooperation and coordination, for example, by making additional staff and money available to agencies participating in the comprehensive planning and management effort; or
- 3) By means of a new law or decree by the President or the Parliament, require agencies to join together and cooperate on the development and operation of a comprehensive planning and management

effort like CZM. Such a "directive" could create a new office for the purposes of supervising the coastal planning work, or it could designate an existing national agency or council as leader of the work or it could create a new inter-agency council to oversee the new program.

A report such as the present one, prepared largely by outsiders on the basis of necessarily incomplete knowledge of the actual situation, can go only so far in "making the case" for what appears to be the next logical step--the decision to begin preparation of comprehensive coastal management programs for the coastal regions of Colombia. In our judgement, that decision can only be taken when the leadership of the government is presented with a convincing proposal that has been prepared by the Colombian agencies having the important ocean and coastal responsibilities. Those agencies have both the responsibility and the competence to undertake the preparation of such a proposal, and unless they see the urgent need for doing so, the effort will, in any case, fail.

The rich and varied coastal zones of Colombia can provide economic benefit and aesthetic pleasure to countless generations of Colombians and their visitors, but only if steps are taken now to plan and manage these unique areas in a comprehensive and sensitive manner.

CHAPTER 6

INSTITUTIONAL CONSIDERATIONS

Biliana Cicin-Sain and Robert W. Knecht

A. Introduction

The purpose of this chapter is to explore the institutional considerations that are involved in the continued development of Colombia's coastal and ocean resources. The first part of the chapter, "Major Institutions," describes the principal governmental agencies and groups involved with coastal and ocean resources management. To the extent allowed by the available data, here we describe agency responsibilities, jurisdiction, funding and staffing levels, marine organization, and organizational issues. The second part, "Intersectoral Considerations," addresses the need to consider intersectoral interactions and to make comparisons among sectors. The next section, "Alternative Approaches," discusses a range of options that is theoretically available for improving management performance as well as options that are specifically under discussion in the Colombian context. Finally, the last section offers a set of conclusions and recommendations on possible organizational approaches.

The analysis in this chapter is based on three major sources of data: (1) consultation of the relevant legislation setting forth agency authorities and jurisdictions (summaries provided by Amparo Ramos, Colombian member of the Plan Maestro de Desarrollo Marítimo); (2) interviews with over 30 agency representatives in Bogotá, Cartagena, Santa Marta, and Barranquilla conducted in May 1983 by the authors of this chapter, in conjunction with Dr. Maynard E. Silva; (3) consultation of the relevant scholarly literature and in-country documents.

The interviews with agency representatives (see appendix B) generally probed for agency missions, legal mandates, size and type of staff, bureaucratic organization, budget trends over time, agency goals, views on short- and long-range prospects for marine resources development, views on organizational reform, relations with other organizational entities, and future plans. These are important variables to consider in any overall assessment of the organization of marine resources management in Colombia for they both shape and constrain the capability of agencies to carry out marine-related mandates. Not all of the questions were asked of each respondent, rather, the questionnaire was used as an informal interview guide, with the questions varying depending on the situation. In general, we were able to interview personnel at high organizational levels. In most cases, agency representatives proved highly cooperative and appeared to respond in a very candid fashion. In a number of instances, such as in visits to the petroleum agency (ECOPETROL) and the port agency (COLPUERTOS), agencies had prepared special reports for our use in anticipation of the questions posed. About 80% of the interviews were conducted in Spanish, with a mean time per interview of two hours. As noted earlier, our introductions stressed the objective and impartial nature of our effort as uninvolved third-party observers.

As a caveat, we should note at the outset of this chapter that the information we were able to obtain on agency missions, capabilities, and behavior is somewhat partial and incomplete, relying as it does mainly on consultation of the relevant legislation and on agency reports. Because there exist few studies (if any) of the implementation of marine programs and because of the relatively brief time we were able to spend on field work, our observations basically represent a static snapshot of marine agency authorities and resources. A dynamic view of the implementation process of marine laws and of the interrelationships among agencies in different stages of the various permitting processes involved, is, unfortunately, not possible given the nature of our data. Such longitudinal data--the only type of data which can provide a truly accurate portrayal of problems and opportunities in agency interactions--we hope, will be gathered in future studies of this kind, in full collaboration with scholars in local universities.

B. Major Institutions

There is a large number of government organizations which are involved, in some way, in research, management, and development of ocean and coastal resources, as is suggested in Figure 6.1, "The Institutional Framework." Given space limitations, this section is confined to an analysis of the marine responsibilities and organization of the principal agencies in each sector, those governmental entities which are currently most involved in ocean and coastal resources research, planning, management and promotion (highlighted in Figure 6.1). Our discussion of each agency also varies according to the extent of its current maritime activities and to the amount of information that we were able to obtain on these activities.

Governmental Organizations Most Involved in Ocean and Coastal Management

DIMAR. The Dirección General Marítima y Portuaria (DIMAR) is the primary government agency with ocean and coastal responsibilities in Colombia. Part of Colombia's Navy (the Armada Nacional in the Ministerio de Defensa), DIMAR was created in 1971 (through Decreto No. 2349) replacing the Dirección de Marina Mercante Colombiana (Merchant Marine). DIMAR is charged with a broad and variegated mandate to: "direct, control, regulate, and develop marine activities" in marine areas under Colombia's control. Its jurisdiction extends to: internal waters, the 200 mile exclusive economic zone, the continental platform, navigable waters, and ports. In the coastal zone, as well, DIMAR exercises jurisdiction over the land area 50 meters inland from the highest tide mark, and it has the power to regulate the use of maritime beaches and submerged lands (with the exception of areas designated as national parks or as tourist or natural resource preserves) (Código Civil 679).

The agency is charged with a multitude of ocean and coastal responsibilities--most of them regulatory in nature, but some are promotional and educational as well. It is the major agency regulating maritime transport and associated port activity: i.e., it is the major advisor to the government on port and marine transport policy (including the development of the merchant marine); administers regulatory policy concerning ports and maritime activities

FIGURE 6.1

INSTITUTIONAL FRAMEWORK FOR COASTAL AND MARINE RESOURCES MANAGEMENT

SOURCE: DNP, Plan de Des., 1980.

under its control; directs the development of the merchant marine; certifies maritime personnel; has regulatory responsibility over safety at sea; regulates international maritime transport and cabotage; in conjunction with other agencies, it controls the flow of maritime traffic and the operation of maritime communications; it controls aids to navigation (e.g., buoys); regulates the acquisition and construction of ships and the distribution of trade among Colombian shipowners to avoid economic waste (as well as to avoid the creation of monopoly (Rairán, pers. comm., 1983)); regulates the ability of Colombian shipowners to charter foreign vessels; approves or disapproves freight agreements between shipowners and transport associations; serves a record keeping function regarding international maritime agreements and conventions; regulates the organization and operation of shipyards; processes cargo preference applications.

In addition to these major port and maritime transport responsibilities, DIMAR also "regulates, controls, and authorizes," all exploration and construction in coastal and marine areas, investigates and regulates marine pollution, is in charge of oceanographic and other marine science investigations, and is charged with enforcement of maritime regulations in Colombian waters.

Permits that are processed by DIMAR include: for commercial dredging; for various types of construction and modification (of piers, wharfs, docks, breakwaters, jetties, landings, drydocks, shipyards); for installations for the storage of oil and gas and other combustibles; for surveys of the coasts, ports, bays, border rivers, and navigable lakes; for exploration of the soil and subsoil of the continental platform; for the installation of aids to navigation.

In addition to these responsibilities, DIMAR (particularly through its oceanographic research institute, CIOH (see below)) has played a key role in the development of coastal and ocean awareness in the country. DIMAR coordinates the Comisión Colombiana de Oceanografía (CCO) (the interagency committee for oceanographic research); it has been an active organizer of the several symposia on marine scientific research held since 1971 (see discussion in Chapter 1); it has taken the lead role in the development of a plan for

marine resources development (the Plan Maestro Desarrollo Marítimo--the present effort); and it has assiduously promoted the reorganization and elevation of marine activities within the government. As is discussed later in this chapter, DIMAR has, at different times, proposed different schemes for the reorganization of marine activities, including the creation of a Cabinet-level Departamento del Mar (Ministry of the Sea), and the creation of a "Natural Marine Resources" division within DIMAR which would incorporate the ocean resource activities of the Instituto Nacional de Recursos Naturales Renovables y del Ambiente (INDERENA, the natural resources agency).

DIMAR's annual budget (1983 figures) was 211,395,326 pesos (or a little over 2 million U.S. dollars). This sum comes from tax receipts on aids to navigation (buoys, lighthouses), taxes for port use and associated paperwork, contractual agreements, and investments. In terms of budgetary expenditures, about 14% supports the central office in Bogotá; about 27% goes to maintain aids to navigation, several research vessels (A.R.C. Quindío, A.R.C. Gorgona, A.R.C. Malpelo, and A.R.C. Providencia), the Centro de Investigaciones Oceanográficas e Hidrográficas (CIOH) (Center for Oceanographic and hydrographic research) in Cartagena, and a marine pollution laboratory in Tumaco; 8% to sustain the Capitanías de Puerto (port captains) in 17 different ports, and the office of Marina Mercante (merchant marine) in Cartagena; with the remaining 50% going to fund special projects in each of the major divisions--central administration, aids to navigation, and capitanías de puerto (DIMAR, Ord. Adm. No. 2, 1983).

In terms of personnel, the agency totals 674 staff, out of which approximately 80% (or 543) are civilians, with Navy officials occupying the top rungs of the bureaucratic ladder.

As a number of observers discussed at the Sasaima workshop and as some of our field observations suggested, the staff and budgetary resources the agency has at its disposal are low in comparison to the multitude of marine and coastal mandates with which the agency is already charged. The marine transportation working group at the Sasaima meeting, for example, stressed that "the legal and actual structure of DIMAR does not correspond to the functions and responsibilities assigned to it by law," and that, moreover,

"the agency lacks the necessary means to effectively implement its assigned functions" (Plan Maestro, June, 1983, p. 104). This assessment was made in particular reference to gaps in the cargo reserve law, to the lack of financial mechanisms for the acquisition of vessels for the merchant marine, to the financial policies of PROEXPO (Fondo de Promoción de Exportaciones, fund for the promotion of exports) which encourage ship repair in foreign ports rather than in domestic shipyards, to insufficient authority in the regulation of cabotage trade, and to insufficient training of personnel related to international marine transport conventions and agreements.

Similarly, our visits to the Capitanías de Puerto in Cartagena and Santa Marta suggested that the level of staff was incommensurate with the variegated responsibilities of the port captains--traffic control, pollution control, enforcement. The Capitanía in Cartagena (the largest port, handling about 54% of all bulk cargo entering or leaving the country, and where marine pollution problems are becoming severe), for example, only had a handful of employees. Our visit to DIMAR's CIOH also suggested that CIOH was not adequately staffed considering the breadth of its research and ocean services. In addition to its cartographic and hydrographic responsibilities, it conducts research programs in marine geology, biological, chemical, and physical oceanography, and is beginning a program in coastal management. The effort devoted to the control of marine pollution also appears low in relation to the growing nature of the problem, particularly in congested areas such as Cartagena and Barranquilla; in addition to some relatively minor marine pollution studies at CIOH, only \$2,237,170 pesos (or approximately 22 thousand U.S. dollars) is budgeted for the pollution control laboratory in Tumaco.

Others of those interviewed, too, stressed problems related to the lack of marine técnicos (technical personnel) available for operating the sophisticated equipment bought in Germany found on the research vessels, primarily the Providencia. The operation of the research vessels has been frustrated by the difficulties associated with the high costs of operation (it is estimated that a 30-day cruise of the Providencia costs ten million pesos (or approximately 97,000 in U.S. dollars) (INGEOMINAS, staff comm., 1983)), and by the lack of trained technical personnel to maintain some of the complex equipment (INVEMAR, staff comm., 1983).

CIOH. The Centro de Investigaciones Oceanográficas e Hidrográficas (CIOH, center for oceanographic and hydrographic research) is an official institution of the Navy, created by resolution No. 0238 of July 9, 1975. As mentioned above, administratively it is a part of DIMAR. It has as its principal objective the execution of scientific research and technological development projects in the various discipline of ocean sciences. It is also responsible for the coordination of diagnostic studies aimed at the elaboration of the "Plan Maestro de Desarrollo Marítimo," of which this study is a part.

Among its many marine responsibilities, DIMAR also provides administrative personnel and facilities for the Comisión Colombiana de Oceanografía to which we now turn.

CCO. The Comisión Colombiana de Oceanografía was created in 1969 (Decreto No. 763) and later reorganized in 1981 and 1983. The CCO is an interagency coordinating committee whose major purpose is to advise the government on marine sciences policy and on the development of human resources in these sciences. More specifically, its functions include: study, propose, and evaluate plans for the promotion of marine science and technology; coordinate and orient all oceanographic studies conducted in Colombian waters; encourage the optimal use of infrastructure and services to support marine research in Colombia; encourage the adaptation and development of marine technology to ensure the adequate exploitation of marine resources; oversee the participation of Colombian entities in international oceanographic research; guide the allocation of monetary resources channelled to marine science and technology projects through the special fund FONDEMAR (Proyecto Especial para el Fomento y Desarrollo de las Ciencias y Tecnologías del Mar) of COLCIENCIAS which is described later in this chapter.

The CCO is administered by the Consejo Nacional de Oceanografía (the National Oceanographic Council) which is composed of high-level representatives of DIMAR, INDERENA, INGEOMINAS, COLCIENCIAS, the Foreign Relations Ministry, the DNP, the CIOH, FONDEMAR, CENIPACIFICO (Center for Technological and Marine Research in the Pacific), as well as two members designated by the President (each of whom takes turns chairing the council for

periods of 6 months). The Council establishes Technical Committees, permanent groups in areas of ocean science composed of representatives from public or private organizations, as appropriate. The Secretary General of the CCO is a senior Naval officer with expertise in marine science, named for a period of no less than two years. Administrative facilities and staff support for CCO are provided by DIMAR (El Espectador, Feb. 13, 1983).

Two problems in the operation of the CCO were mentioned by several respondents. First, given the small size of its permanent staff, the CCO must rely on the efforts of its technical committees to perform studies and analyses. Second, CCO's lack of full control over the disposition of money from FONDEMAR and the low levels of funds in FONDEMAR reduce CCO's leverage over program directions in the other government agencies.

INDERENA The Instituto Nacional de Recursos Naturales Renovables y del Ambiente (INDERENA) is the major agency charged with the protection of the environment (including pollution), and with the conservation and management of the country's renewable natural resources (including forestry, national parks, water resources, wildlife, and fisheries). In addition to a protective function, the agency's mission includes research, promotion, and development efforts to insure that natural resources are utilized in a rational manner by all Colombians. First created in 1968 and then reorganized and renamed in 1976, the agency forms part of the Sector Agropecuario (pertaining to farming and animal husbandry) of the Ministry of Agriculture (Decreto No. 133 of 1976).

With respect to fisheries, the agency enjoys management authority over all saltwater and freshwater living marine resources with the exception of those freshwater resources assigned to specific Regional Corporations, which fall under the authority of the Departamento Nacional de Planeación (the national planning office). (For example, the Corporación Autónoma Regional del Cauca (CVC) was recently given responsibility over the entire Pacific coast, including the development of fisheries in the area (Stargardt, 1983)).

The avowed goals of the agency vis-a-vis fisheries are to increase food production, improve the economic and social situation of the rural sector,

contribute to the national supply of protein, increase the number of people involved in artisanal fisheries as well as help augment their incomes, and evaluate the ecological conditions necessary for carrying out these objectives (Ramos, pers. comm., 1983). In the interviews we conducted with agency personnel in May 1983, INDERENA staff emphasized dual goals of improving the balance of payments through increasing exports of industrial fishery products without neglecting, however, responsibilities for improving the plight of artisanal fishermen who typically subsist in poor conditions (INDERENA, staff comm., 1983).

Among the agency's regulatory powers are the ability to prohibit the taking of specific species, setting aside natural reserve zones as well as zones for the exclusive use of subsistence fishermen or cooperatives, authorizing the importation, transplantation or exportation of species, and the authority to grant permits which are required for all types of fishing (with the exception of subsistence fishing). Fishing activities involving the use of vessels must also receive a permit from DIMAR. As discussed in Chapter 2, enforcement of fishing regulations at sea also falls within the purview of DIMAR.

Total staff of the agency numbers approximately 2600 to 2700 employees. Its annual budget totals \$1,445,005,000 pesos (or close to 15 million U.S. dollars). Management of both industrial and artisanal fisheries and fishery investigations are the responsibility of the Subgerencia Pesca y Fauna (sub-division on fisheries and wildlife) which has approximately 350 employees (about 70 professionals) with a total budget of circa 160 million pesos (or a little over 1.5 million U.S. dollars). In our interviews, we could not ascertain the number of staff in the sub-division devoted to maritime fisheries, but we would estimate it to be low given that the Pesca y Fauna sub-division includes several other sections on terrestrial wildlife management and that much of the fishery effort of INDERENA is concerned with internal waters (INDERENA staff comm., 1983).

There are a number of other agencies concerned with fisheries management and development; a recent analysis reported in Chapter 2, in fact, counts over 43 entities--spread in different ministries and at different levels--being

involved in fisheries. Among the entities most closely related to INDERENA are the Oficina de Planeamiento del Sector Agropecuario (OPSA, the planning office), which, following the guidelines of DNP, makes development plans for the food and fiber sector within the Ministry of Agriculture, and the Comisión Nacional de Pesca (CONALPES), an advisory commission to the Ministry of Agriculture, created in 1980 and composed of representatives from other relevant agencies and from user groups (such as industrial fishery representatives--the Comisión de Pesca de la Asociación Nacional de Industriales (ANDI)--and artisanal fishery representatives--the Asociación Nacional de Pescadores Artesanales (ANPAC)). Although created in 1980, it has only been in mid-1983 that CONALPES has begun to meet fairly actively (Bolaños, pers. comm., 1984).

While respondents in our interviews uniformly praised the dedication and quality of INDERENA personnel, criticisms of the institutional organization of fisheries in Colombia were voiced repeatedly. In fact, numerous critiques of the low priority given to fisheries within the Colombian governmental system have been expressed in several previous documents and reports, in particular in the fishery development plans prepared under the auspices of DNP (DNP, Plan Indicativo del Sector Pesquero Industrial, 1979). These criticisms could be summarized as follows:

--fishery matters find themselves too low in the governmental hierarchy, subservient first to an agency with many other concerns (such as forest management), which is itself buried in a ministry where agricultural concerns dominate (corresponding to the current importance of agriculture in the Colombian economy).

--the level of effort (both in terms of research and management) is consequently too low. It is not surprising, then, that knowledge about fishery resources remains sparse, and largely relies on infrequent and sporadic foreign surveys.

--INDERENA lacks a planning capability. This function is performed at a much higher level in the organization, in OPSA, which is inevitably preoccupied with other priorities in the food and fiber sector.

--neither INDERENA nor other entities concerned with fisheries appear to have faced very squarely the difficulties which are potentially involved in simultaneously attempting to pursue both industrial and artisanal fishery development.

--while INDERENA clearly has a fishery development mission, it lacks access to the credit resources necessary to achieve such development, as the granting of credit falls within the purview of other agencies such as IFI (Institute de Fomento Industrial) and PROEXPO.

--Although a welcome effort to achieve better coordination, CONALPES lacks appropriate authoritative power.

CNT. The Corporación Nacional de Turismo (CNT), was created in 1968 (Decreto No. 2700) to promote and regulate the development of tourism in Colombia. CNT is found under the tutelage of the Ministerio de Desarrollo Económico (economic development ministry) and is administered by a council, presided by the economic development minister and including representation of the national planning department (DNP) and several presidential appointees. Its specific functions include: study tourism potential; prepare plans for tourist development; prepare plans for tourism education at various levels; promote tourism advertising campaigns; recommend to the government the declaration of special tourist areas; in conjunction with other authorities, coordinate, regulate and control urban development in the special tourist areas; expropriate property under certain conditions; issue bonds; promote and give out credit for tourism development; advise sources of foreign investment for tourism; build public works related to tourism in cases where the lack of private activity necessitates it; promote the construction of hotels and other tourist facilities; regulate the use of maritime beaches and the intertidal zone in special tourist areas (Ramos, pers. comm., 1983). Specific permits issued by the agency include licenses for the operation of tourist hotels.

Funding for CNT comes primarily from taxes imposed on tourist facilities (5% lodging tax on hotels) and on international transportation companies (5% on the value of the travel). Total annual budget for the agency was

2,186,521,000 Colombian pesos (or about 21 million U.S. dollars). Agency staff totals about 400, with 22 individuals working in the CNT planning office, most of them professional planners, many trained abroad in such countries as Mexico, Spain and France.

As was discussed in Chapter 5, although Colombia lacks an explicit authority for coastal zone management, CNT operates, in some ways, as a planning entity in the coastal zone through its authority to set up special zones for the orderly development of the coastline. Under the auspices of a 1972 directive, perhaps as much as 1/4 of the Atlantic Coast has been designated either as "zonas de reserva" (reserve zones) or "zonas de desarrollo turístico" (tourist development zones). In the zonas de desarrollo, entities wishing to build facilities must do so in conformance with the CNT plan for the area and must obtain a CNT permit. The reserve zones are basically set aside until the time is ripe for development and until the local area becomes self-sufficient in terms of infrastructure, roads, etc. Local governments play an important role in the designation and implementation of these zones--they ultimately must agree to enact the zonal regulations proposed by CNT.

Some problems with the operation of CNT mentioned by respondents include:

--there is no explicit authority nor program for management of the coastal zone.

--the interrelationships among the permitting processes of DIMAR, INDERENA, CNT, are not very clear. All three, for example, appear to have roles in the protection of the islands of Rosario (8 natural islands and 22 artificial ones).

--CNT has come into conflict with INDERENA in the Tayrona Park development proposal---relationships between these agencies continue to be tense at times.

--CNT has an interest in underwater parks and marine archaeology, an interest that will have to be coordinated with DIMAR and INDERENA.

COLCIENCIAS. The Fondo Colombiano de Investigaciones Científicas y Proyectos Especiales "Francisco José de Caldas," (COLCIENCIAS) was established in 1969 (through Decreto No. 2869) with the major mission of promoting and funding scientific and technological research. COLCIENCIAS is adscribed to the Ministerio de Educación (ministry of education) and for its support, receives a direct allocation from the Bureau of the Budget, in addition to obtaining and channelling funds from international sources, such as the Organization of American States. One estimate of agency expenditures (COLCIENCIAS pamphlet, n.d.) reports that the agency has approved more than 700 research projects, awarding approximately U.S.\$3 million in grants; agency staff totals about 75.

The agency's involvement in marine matters has been significant and long-standing. Beginning with its 1971 proposal to then President Pastrana Borrero of a project on a national program for marine studies, the agency has been a key actor in the government's effort to develop marine science and technology and, as noted in Chapter 1, COLCIENCIAS has been an active promoter and participant of the several ocean symposia held in the seventies, one of the formulators of the 1978 diagnostic "Situación Actual y Perspectivas Futuras de las Ciencias del Mar en Colombia," and along with other agencies, a drafter of the 1980 plan for marine science development (DNP, Plan. de Des., 1980).

Following the recommendations of the 1980 development plan, a special fund to support marine studies, "Proyecto Especial para el Fomento y Desarrollo de las Ciencias y Tecnologías del Mar," FONDEMAR, was created within COLCIENCIAS. FONDEMAR's purposes are to: contribute to the development of the scientific and technological oceanographic infrastructure; carry out research projects recommended in the 1980 plan; strengthen oceanographic support services; strengthen training programs in the marine sciences; promote and develop international marine science cooperation; support the CCO; optimize the financial efforts of other Colombian institutions in the marine science area, following the recommendations of the CCO. The proposed budget for FONDEMAR in 1983 was 483,000,000 Colombian pesos (or over 4.5 million U.S. dollars) (Hernandez, per. comm. 1983). It appears, however, that the funding levels authorized have been less than expected due to the current government deficit, and agencies have had to make contributions from their own budgets.

COLCIENCIAS also operates INVEMAR, an important marine biological station located near Santa Marta.

COLPUERTOS. The Empresa Colombiana de Puertos (COLPUERTOS), created in 1959 as a state commercial enterprise attached to the Ministerio de Obras Públicas y Transporte (Ministry of Public Works and Transportation) is charged with the direction, administration, exploitation, conservation, and surveillance of Colombian public ports. The specific functions of the agency include the handling and storage of cargo; the construction of port facilities; the setting of rate structure for port services; port surveillance; oversight of private port construction. The agency is administered at the national level by a national governing council (presided by the minister of public works and transport, and including several presidential appointees, and representatives from DIMAR, Aduanas (customs), Empresas Navieras Nacionales (National Shipping Companies), industry, and user groups (CUTMA, the Consejo Colombiano de Usuarios del Transporte), and through a general manager. This administrative structure is replicated in each port terminal. For its budget, the agency relies on port taxes and user fees, with 20% of proceeds destined to the national office, and with 80% remaining in each respective terminal.

COLPUERTOS has a staff of about 11,000 people operating principally out of headquarters in Bogotá and in seven ports operated by the agency. The organization has major financial problems apparently brought about by excessive labor costs and inefficient port operations. Labor unrest and labor-management disputes over wages, benefits (especially medical), and working conditions, have become endemic. Observers have questioned the management of the overall organization as well as the operations of particular ports.

INGEOMINAS. Created in 1968 through Decree No. 3161, the Instituto de Investigaciones Geológico Mineras (INGEOMINAS) forms part of the Ministerio de Minas y Energía (mines and energy) and is charged with the conduct of geological and mineralogical research throughout Colombia. Its specific functions include: study of non-renewable resources; geological mapping;

determination of the potential of mineral resources for industry and agriculture; stimulation of investments in the exploration and exploitation of metallic and non-metallic minerals; exploration of subterranean water resources to improve the national supply of potable water; encouragement of studies in the relevant scientific disciplines to assist in the conduct of geological studies.

The annual budget of the agency is approximately 600,000,000 pesos (or a little under 6 million U.S. dollars); about 60% of the funding comes from the government, and 40% from interagency agreements (INGEOMINAS, staff comm., 1983). Total agency staff numbers approximately 600 individuals, of which 90 are geologists and 42 are chemists.

The agency has only become involved in the study of marine processes in the last six years, although its director, Alfonso Lopez-Reina, has been an active participant in international ocean science efforts. Currently, the marine geology program consists of 8 marine geologists, several with doctoral level training. Following the strategies recommended in the Plan de Desarrollo de las Ciencias y Tecnologías del Mar (DNP, 1980), cooperative programs with outside research organizations, such as Lamont-Doherty Laboratory at Columbia University and the U.S. Geological Survey have been established. To further facilitate the development of marine geological exploration, establishment of a new marine region has been proposed and is awaiting governmental approval.

INGEOMINAS personnel mentioned a number of problems they face in their efforts to improve geological surveying: uncertain access to the "proprietary" information held by foreign governments conducting cruises in Colombian waters makes it difficult to obtain a full account of what is known about the geology of Colombia's seafloor and continental platform; there has existed a "brain drain" problem, whereby students engaged in training outside of the country, sometimes have not returned; there is insufficient contact with scientists in other nations; and outdated equipment prevents the application of the most modern techniques. Problems with the instrumentation on the research vessel (Providencia) were also highlighted (INGEOMINAS, staff comm., 1983).

ECOPETROL. The Empresa Colombiana de Petróleo (ECOPETROL), first created in 1948 and last reorganized in 1970, is a state industrial and commercial enterprise (empresa) charged with the administration and management of all petroleum fields, pipelines, terminals and other petroleum installations under the control of the state. As INGEOMINAS, it is also found under the general tutelage (tutela) of the Ministry of Mines and Energy. ECOPETROL is a well endowed agency with an annual budget of approximately 2,000,000,000 Colombian pesos (or close to 20 million U.S. dollars). Its staff, totalling about 10,000 employees, is in general highly trained and well recompensed.

The agency has 37 joint venture agreements (contratos de asociación) with 15 foreign companies. According to the interviews we conducted with ECOPETROL staff in Bogotá, two types of contract arrangements exist. In contracts for exploration, foreign firms put up all of the needed capital and, if exploration is successful, are later reimbursed (in produced oil) for 50% of the exploration costs. In contracts for production, ECOPETROL and the foreign companies each put up 50% of the production costs and share equally in the decision making process. Subsequently, ECOPETROL keeps 60% of the oil produced, while the foreign firm gets 40% (which Colombia buys at world oil prices plus a small increment). In general terms, ECOPETROL and other agencies expressed satisfaction with these arrangements as fair and profitable to both concerned parties.

Currently, it appears that only one major joint venture arrangement is in effect offshore, in conjunction with TEXACO. Our interviews with ECOPETROL suggested that the agency is very interested in accelerating its offshore exploration program, but that presently there is insufficient foreign interest in offshore joint ventures. This is due to depressed world oil prices as well as the fact that land exploration in Colombia continues to look more promising, less risky, and less costly (ECOPETROL, staff comm., 1983). As is discussed in Chapter 3, no separate process for leasing offshore lands exists at present in Colombia. Offshore oil and gas development follows the same rules and regulations for petroleum and gas development on land.

In terms of geological research, the agency relies primarily on the work of its own staff (circa 48 geologists) and on the expertise of their foreign partners. Its use of data generated by INGEOMINAS is small.

We should note that the agency was very forthcoming in providing information for this study, preparing a close to 200-page report with background information.

DNP. The Departamento Nacional de Planeación (DNP), restructured in 1974 through Executive Decree 627, along with the Consejo Nacional de Política Económica y Social (CONPES) is charged with the establishment of planning norms which planning departments in all public agencies must follow in the elaboration of development plans; the elaboration and coordination of all general plans for economic and social development and their presentation to CONPES for evaluation and approval prior to their presentation to Congress; in collaboration with other agencies, the elaboration of sector-specific, and regional and urban plans; the monitoring of the implementation of plans and reports to the President of the Republic and to other government leaders of irregularities or obstacles in plan implementation; presentation to CONPES of a budgetary plan for social and economic expenditures and working with the Budget Office in the development of the budget; overseeing development agreements with foreign nations; coordinating and overseeing foreign technical assistance efforts.

Ocean related activities fall under three different divisions in DNP: ports and harbors under Transport, fisheries under Agriculture, and minerals and oil and gas under Non-Renewable Resources. DNP staff, composed largely of economists and planners, appears to feel that much better information on the economic potential of marine resources must be obtained and synthesized, if additional support is to be obtained for ocean programs. They do not appear to favor a major government emphasis on ocean resources prior to the time that ocean activities "prove themselves" (DNP, staff comm., 1983).

REGIONAL CORPORATIONS. The Corporaciones Regionales, are regional entities under the tutelage of the National Planning Department, empowered to make and carry out development plans for specific regions. A total of 9 regional corporations are currently in existence (Ramos, pers. comm. 1983). One such corporation with significant marine relevance is the Corporación

Autónoma Regional del Valle y Cauca (C.V.C.) which has authority for planning, natural resources management, energy production, and water management for much of the Pacific Coast region. Along with other agencies, the C.V.C. has been responsible for formulating a master plan for the development of the Pacific Coast region--the PLADEICOP (Plan de Desarrollo Integral para la Costa Pacífica). The annual budget for the C.V.C. totalled over 17 billion Colombian pesos, or close to 170 million U.S. dollars.

Other governmental entities involved from time to time in coastal and ocean resources planning, promotion, and management (included in our agency visits) are: the Instituto de Fomento Industrial (IFI, agency for industrial development), Instituto Colombiano de Comercio Exterior (INCOMEX, foreign commerce agency), Fondo de Promoción de Exportaciones (PROEXPO, export promotion fund), and CARBOCOL (the Colombian national coal company).

Summary

Major organizational problems/issues that are suggested by the foregoing review may be summarized as follows:

1. The level of ocean involvement among Colombian agencies is low.

With the exception of DIMAR and CCO for which ocean affairs represent a central concern, for other agencies, ocean related-activities are matters that are subsidiary to other concerns and activities.

2. In general, there is a low level of staff and budgetary resources devoted to an ocean effort.

This is equally true of agencies with a major ocean mission (such as DIMAR and CCO) and of agencies with a subsidiary concern in the oceans (such as INDERENA, INGEOMINAS).

3. Ocean activities tend to be located at low levels in the governmental bureaucratic hierarchy.

This is particularly true in the fishery sector where resource

potential would seem to warrant elevating fishery affairs to a higher organizational level.

4. There appears to be some lack of communication/cooperation among agencies in different sectors.

Fishery development and port development do not appear to be well coordinated, for example. Port development (such as in the Bahia Portete case) has not been well coordinated with other coastal uses, such as tourism. Fishery agencies appear to lack access to credit resources within the purview of financial institutions such as IFI and PROEXPO.

5. There is some lack of clarity (duplication/overlap) in jurisdictional mandates.

This appears particularly evident in the relationships among DIMAR, INDERENA, and CNT in their respective jurisdictions over coastal lands and waters, among DIMAR and INDERENA over enforcement of fishing regulations, among INGEOMINAS and ECOPETROL in the collection and dissemination of geological data.

6. Better inter-institutional coordination and cooperation is needed.

This concern was voiced by a number of agencies both in discussions with our team, as well as during the Sasaima workshop and in inter-agency meetings following that workshop. The minerals group at Sasaima, for example, called for the creation of an inter-institutional coordinating committee; the fisheries group called for the coordination and prioritizing of governmental research activities (Plan Maestro de Desarrollo Marítimo, Taller de Trabajo, 1983).

Before we explore how these organizational concerns may be addressed (in part E of this chapter), we turn to a brief discussion of intersectoral considerations that should be taken into account in the crafting of overall ocean management approaches.

C. Intersectoral Considerations

Typically, analyses of marine policy have been conducted on a sector by sector basis, e.g, fisheries and aquaculture, ocean energy resources, marine transportation, coastal zone resources and their utilization. To a large extent, this is indeed the approach we too have followed in this study.

However, from the standpoint of optimally organizing the government's ocean activities and making investment decisions among different sectors, there is a need to understand the interactions among sectors and the need to be able to make comparisons among sectors. This is a notably underdeveloped area in marine policy largely because nations have tended to develop each sector in isolation without appreciating the need to formulate a more comprehensive strategy. Once some marine sectors are developed, it is difficult for inter-sectoral planning and comparisons to occur, as established sectoral groups and organizations become resistant to outside influence and change.

As was discussed in Chapter 3, knowledge of the likely interactions among sectors provides information that is vital to government as it goes about building its ocean program (shaping institutional relationships, formulating ocean policy, establishing decision-making processes) for a variety of reasons--e.g., capitalizing on complementarities among sectors; mitigating or eliminating adverse impacts of one sector on another; building an effective communications exchange; anticipating inter-agency conflict; anticipating the creation of new demand.

Concomitantly, an ability to make comparisons among sectors is crucial if government is to be in a position to make rational investment choices and to establish development priorities among various sectors. Making such comparisons requires information on both the development prospects inherent in each sector, and the interaction effects, positive and negative, of the development of each marine sector on the others.

Intersectoral Interactions

Interactions among sectors are of several types and can be both negative and positive in their impacts. The classification scheme for inter-sectoral interactions presented in Chapter 3 (Table 3.7, on p. 80), by James Broadus provides a guide to likely interaction effects between the marine minerals and energy sector and other marine and coastal uses. Broadus considers the following positive types of interactions among uses: infrastructure complementarities, information exchange, demand creation, technological spin-offs, and shared support services. Possible negative interactions include use conflict, congestion and interference, environmental risk, and inter-agency conflict. Similar tables could be prepared to show the current and potential interaction effects between each of the other sectors on the remaining marine and coastal uses. A more refined analysis of this type could be used to design administrative and technical guidelines that would help ensure that negative impacts and conflict among sectors is minimized and that complementarities and benefits are fully realized.

Intersectoral Comparisons

In a situation of limited resources, governments must inevitably determine the extent to which investments in a given sector can achieve current national goals in comparison to investments in other sectors. Fundamentally, these comparisons are no different than comparisons involving non-marine sectors, except that intersectoral interaction effects may play a more prominent role in some marine and coastal cases; in fact, in some instances, some uses may not prove to be compatible with other marine and coastal uses. For example, a decision to encourage additional industrial activity at or near the Portete coal port might well preclude the possibility of development of sites with tourism potential in the nearby region.

In Table 6.1, we present a parsimonious checklist of factors to consider in preparing to make intersectoral comparisons. Information of the type shown on the table should be collected for each sector. The most attractive sectors for government investment would be those that appeared most promising based on

detailed assessments of current conditions and potential for growth, and a careful analysis of interaction impacts on other marine sectors. As additional information becomes available, especially on the economic potential of various types of marine resources, systematic cost-benefit comparisons of alternative courses of action should be attempted. The expertise of academic groups specialized in such studies such as the Centro de Estudios de Desarrollo Económico at the Universidad de los Andes would be helpful in these analyses.

Discussions about making comparisons and choices among marine sectors raises some important institutional considerations. It is perhaps obvious that the making of development choices among different sectors will be politically difficult to accomplish, as it is a choice that will favor some sectors over others. We believe that this type of politically sensitive decision-making can only be accomplished by an organizational entity which is located at a relatively high level in the governmental structure. Extensive organizational experience suggests that, for example, interagency committees which represent different agencies at similar bureaucratic levels, because of their egalitarian structure with no hierarchically superior level of government in charge, are unable to make choices that benefit some programs and not others. The inevitable tendency in such interagency processes, it seems, is to reward all--to give everyone a piece of the pie without making the difficult choices.

In this context, as some of our interviewees pointed out (e.g., Hernandez, pers. comm. 1983), we believe that it is important to recognize that because intersectoral choices must ultimately be made, the creation of a master plan for marine resources management will necessarily involve a much more difficult, controversial, and protracted process than the creation of the 1980 science and technology development plan. Although the process of creating the 1980 plan was by no means easy--participants suggest that it took an entire decade for the plan to evolve--it did not evoke extensive controversy, calling, as it did, for an expanding program from which most sectors of the scientific community could benefit.

TABLE 6.1

CHECKLIST OF FACTORS TO CONSIDER IN MAKING
INTERSECTORAL COMPARISONS

Ascertain for each sector:

1. CURRENT CONDITIONS

Basic socio-economic indicators (internal)

- existing importance (size) of sector in economy
- number of people involved (types of people involved, skilled/unskilled, nature of their involvement)
- rates of change (growth/decline) over the last 5 to 10 year period
- export/import ratio
- foreign exchange earnings
- extent of foreign investment
- multiplier (secondary and tertiary) effects
- current rates of return on investment

Governmental/organizational indicators (internal)

- existence/clarity of sector goals/national goals
- consistency between sector goals/national goals
- sufficient authority/jurisdiction
- funding levels
- staffing levels/training levels
- organizational "unity"/coordination of effort
- enforcement/implementation capability
- development plans in existence? status of plan formulation/implementation

2. POTENTIAL FOR GROWTH

Internal factors

- knowledge of resource potential
- access to capital
- incentives for investment
- availability of infrastructure/support services
- availability of trained labor
- availability of technology/managerial talent
- political "will"/supportive constituencies

External factors

- condition of world and regional markets (including legal framework)
 - interest among potential investors/joint venture potential
 - comparative experience (what worked/didn't work in other cases)
 - availability of international assistance/funding, training programs, technical assistance
 - prospects for regional cooperation
 - strength of present and emerging competition
 - possibility of substitutes
-

While we strongly believe that extensive and detailed intersectoral analyses will need to be undertaken by the Colombian government in making rational development choices, we would be amiss if we did not at least provide some tentative assessments about which sectors appear to offer the most immediate potential, at least in the near term. A crude first cut at the potential contributions of different marine sectors to the national goals enunciated in the 1983 national development plan (Cambio con Equidad, DNP, 1982) is as follows:

Increased employment: The coastal tourism and fisheries sectors, in our judgment, have the potential to create substantial increases in employment; increases associated with the minerals and ports sectors would be more modest.

Foreign earnings: The coastal tourism and minerals/energy sectors seem to hold the largest potential for foreign earnings increases; more modest gains are seen in the fisheries and ports sectors.

Regional development: Coastal tourism has, in our judgment, the largest potential for stimulating regional development, although the fisheries and minerals/energy sectors could, under certain circumstances, significantly affect regions of both the Atlantic and Pacific coasts.

Increased protein: The fisheries sector has the potential to help lift the protein levels in the population, provided that problems of distribution, marketing, and consumption preferences are overcome.

D. Alternative Approaches

Calls for developing integrated coastal and ocean resources management approaches have become increasingly numerous as ocean uses have heightened and the interconnections among them have become more manifest (Sorensen, McCreary and Hershman, 1983). In this section, we first discuss the concept of integrated ocean and coastal policy drawing on recent work by Underdal (1983), and subsequently discuss its possible application to the case of Colombia.

"Integrated policy," according to Underdal, must meet three basic requirements: comprehensiveness, aggregation, and consistency. Comprehensiveness (or scope) is measured along at least four dimensions--time, space, actors and issues. That is, does the policy take into account long-range as well as short range considerations? Spatially, does it

encompass the proper area for management--conforming to distinct ecological systems rather than convenient bureaucratic boundaries? Does it include the total number of actors whose behavior will be affected in implementation? And, finally, does it subsume all of the issues which are interdependent with one another?

Aggregation means basing decisions on some aggregate evaluation of policy consequences, that is, the extent to which policy alternatives are evaluated from an "overall" perspective rather than solely from the perspective of each actor or sector.

Finally, the requirement of consistent policy (policy that is in harmony with itself, one whose different components accord with each other) can be measured along vertical as well as horizontal dimensions. The vertical aspect refers to the accord between policy levels, where specific implementation measures conform to more general guidelines and to policy goals. Consistency along the horizontal dimension means that for any given issue and policy level, the same policy is being pursued at a time by all the executive agencies involved.

As Underdal points out, in some cases, these requirements may "pull" in different directions; the more comprehensive a policy, for example, the more centrifugal forces that will be at work and the more actors that will be involved, hence increasing the potential for inconsistency among them.

In addition to these general considerations, policy integration for ocean activities also implies employing an integrated perspective on the ocean system and human uses of that system--a view that includes scientific and technological knowledge about ocean resources and processes, anthropological and social knowledge about maritime communities which live by and depend on the ocean for their subsistence, knowledge about economic extractive activities, knowledge about international and domestic laws which mold access to ocean resources. In short, an integrated view of ocean policy implies a multidisciplinary perspective involving a variety of disciplines, including the marine sciences, political science, economics, anthropology and law. An integrated perspective on marine policy, too, as we discussed in the last

section, implies consideration of the interconnections that occur among diverse ocean sectors.

The most general purpose of policy integration is to improve policy outcomes and to avoid negative or unintended consequences which may accrue to a fragmented policy approach. While this is a highly desirable goal, one ought not to neglect to consider the cost of integration efforts. As Underdal points out (1983, p. 65), "To establish the fact that improved policy integration can lead to some increase in gross benefits for society does not in itself provide a compelling argument for making additional integration efforts. It has to be proved also that marginal cost does not outweigh marginal gain." A calculation of costs should include consideration not only of such obvious indicators as the costs of new government bureaucracies or programs, but also assessment of loss of performance in other issue areas attributable to a transfer of resources to the issue area in question, and possible adverse effects on such "democratic" values as decentralization and broad participation.

Common approaches to improve policy integration include: 1) policy pronouncements made at the highest levels of government, presumably to be followed by all government agencies involved in the issue area; 2) reorganization of government entities; 3) reorganization of governmental processes; 4) the training of personnel, teaching new skills and perspectives; and 5) financial incentives.

Reorganization approaches may involve such actions as moving issues "upwards" (i.e. from the local to the national level); transferring them horizontally (from a narrow sector agency to one with a broader perspective); modifying decisionmaking procedures (requiring public hearings, environmental impact statements, joint proposals, etc.); redistributing resources or authorities between institutions; increasing the capacity of planning offices; creating new institutions.

Training and awareness raising approaches involve the inculcation of new skills, perspectives, or ways of thinking to decision-makers and their staffs in order that they may gain an appreciation of the ocean orientation, needs

and goals of other ocean interests, and hence of the need for an integrated management approach. In specific marine policy terms, this implies the formation of a new cadre of resource managers trained to think more comprehensively and holistically about the problems of ocean resources exploitation and management--the development, in short, of a truly interdisciplinary perspective. This is much more difficult to achieve than it might seem at first. Typically, in many nations (including in Colombia) ocean awareness at the national level develops along two parallel lines--one involving international legal concepts and largely pursued by the Foreign Relations Ministry--and the other primarily scientific and technical in nature, pursued by the Navy and by the marine scientific community. As national ocean needs broaden to include a major concern for the exploitation of marine resources, a new cadre of ocean resource managers must be developed.

In the Colombian case, most of these policy integration approaches have been utilized or suggested at some time or another, albeit with varying degrees of emphasis. Although training has perhaps been least often considered, policy pronouncements on ocean matters by the President have been important in focusing attention on the oceans, financial incentives have been procured through FONDEMAR, and several government reorganization proposals have been made at different times. DIMAR, in particular, has offered several suggestions along these lines. Specifically, it has recommended the creation of a marine resources development program within an expanded DIMAR within which would be located the present marine resources development activities of both INDERENA and INGEOMINAS. DIMAR has also suggested that a Ministry of the Oceans be considered. All ocean-related activities with the exception of those that are clearly military in nature, would be encompassed within the new Ministry. A recommendation emanating from the 1977 Third Seminar on Marine Sciences also called for the creation of a marine resources focus in the Department of National Planning.

Because reorganization, including the creation of new organizations, is probably the most frequently proposed tactic to improve policy integration at the national government level, we briefly review below the experience of other nations in the organization of their ocean activities.

Mexico - Although Mexico is now a world-class fishing power, has very large offshore oil and gas production, and has emphasized the development of international resorts in its coastal zones, it has not created any kind of broad ocean resources development focus at the national level. What it has done is to elevate its fisheries program successively from an agency level to a sub-secretary level to a full ministry (the Secretaría de Pesca, created in 1982) (Cicin-Sain et al, 1983). Mexico also has an oceanographic commission focusing on the coordination of marine science.

United States - Although a prestigious blue ribbon committee recommended the creation of a national oceans agency in 1969, and the National Oceanic and Atmospheric Administration (NOAA) was created in 1970, the reorganization failed (for political reasons) to include several major ocean activities--offshore oil and gas management, the Coast Guard (pollution monitoring, surveillance, fisheries enforcement, safety at sea), and the regulation of ocean dumping; these functions were left in other agencies where they remain today (Abel, 1981). NOAA, however, does contain ocean charting and mapping, hydrographic surveys, marine fisheries management and conservation, ocean and weather services, earth and weather satellite observing systems, ocean and atmospheric research, coastal zone management, and seabed mining.

Brazil - Brazil possesses the longest shoreline in South America, rich fisheries grounds, and significant offshore oil and gas deposits. It has no centralized oceans ministry but has had, since 1974, an interministerial commission (CIRM) headed by the Navy to advise the Presidency and suggest guidelines concerning a national policy for marine resources. CIRM also coordinates government funding of marine science. In 1980, a decree established a national policy for ocean research and provided guidelines to focus science and technology more closely on ocean resources development. A special fund of \$50,000,000 dollars was created in 1982 to support the augmented scientific and technical effort. In March of 1983, a national maritime commission (COMANA) was created to broaden still further these efforts, thus encompassing not only ocean resources and R & D, but also shipping, shipbuilding, coastal and ocean safety and national security, marine awareness, and international relations. A national maritime policy was recently established through Decree no. 89.331 of January, 1984. (Pires, pers. comm., 1984).

Ecuador - As Brazil, Ecuador has very important marine resources. Rich fisheries exist off its coast and in the Gulf of Guayaquil. Recently there has been a huge increase in the aquaculture of shrimp in coastal ponds. Also, oil and gas exploration continues in Ecuadorian coastal waters. In Ecuador, as in Brazil and Colombia, the Navy plays a key role in ocean activities. In addition to its military functions, it operates a small but effective office of maritime awareness (DIGEIM) which serves an education and facilitation function. Another part of the Navy operates the ports, ocean dumping regulation, and coastal zone licensing procedures. The Navy also is the principal agency conducting ocean research, charting, and maritime safety (INOCAR). Ocean resources and development missions are handled by a sub-secretary for fisheries (an element of the Agricultural Ministry) and in a minerals sub-section of the Ministry of Natural Resources (Vallejo, 1983).

Japan - As a highly industrialized island nation, Japan has substantial ocean interests ranging from fisheries and shipping to ocean energy and minerals. A principal means for coordinating ocean resources development in Japan is a council for ocean development that advises the Prime Minister (an interministerial marine science and technology committee also is set at that level). Beyond this, however, one has to look relatively deep within the various ministries to find ocean offices, several of which are located in the Ministry of International Trade and Industry (MITI). Fisheries is managed by a fishery agency attached to the Ministry of Agriculture and Forestry. Yet, even with this relatively fragmented organizational approach, one has the clear impression that policy integration is taking place in Japan--that the many disparate ocean units indeed understand the ocean policy of the country and are working toward common objectives (Friedheim et al, 1984). Close cooperation between government and industry characterizes much of Japan's ocean programs.

France - Perhaps France, Japan, and the Federal Republic of Germany, among the developed countries of the West, have been the most active in the oceans resources development area. Of these, France has, outwardly at least, come closest to creating a clear ocean organizational focus at the national level of government. In 1967, it created the National Center for the Exploitation of the Oceans (CNEXO) with the objective of promoting scientific research and techniques for enhancing the value of ocean resources (CNEXO, 1983). Shortly thereafter, an Interministerial Committee for the Sea was created, chaired by the Prime Minister. In 1981, a Ministry of the Sea was created with responsibility for the merchant marine, maritime ports, and fisheries and aquaculture. However, important functions and responsibilities remain in other ministries. For example, CNEXO is now under the joint authority of the Ministry of Research and Industry and the newly created Ministry for the Sea. Thus, some fragmentation in ocean responsibilities remains.

Soviet Union - Ocean resources are of considerable importance to the USSR yet there does not appear to be a central governmental focus for ocean programs. The Academy of Sciences oversees the effort in the ocean sciences while individual ministries conduct applied research and operate resource exploitation programs--a ministry of geology for deep seabed mining, a ministry of oil and gas for offshore oil and hard minerals of the continental shelf, and a ministry of fisheries for living marine resources. Major ocean decisions in the USSR are apparently taken by a "state committee."

This brief review of a diverse set of country experiences with ocean organization as well as our general conceptual discussion suggests several points:

--reorganization under a broad "ocean" aegis has seldom been utilized.

Indeed, the only recent manifestations of this type of umbrella approach were seen in the early and mid-seventies when a number of nations created ministries of the environment or of natural resources and the environment.

--in most cases, it appears that nations have not relied on a single approach, but have utilized a combination of methods (such as the formation of interagency committees, the offering of financial incentives) to better integrate and focus their ocean activities.

--the results of reorganization in some countries, notably the United States, have been mixed with regard to the success of this approach. In the U.S., organizational barriers continue to impede efforts at policy integration long after the creation of a new "oceans agency" in 1970 (Cicin-Sain, 1982, 1983). The U.S. experience suggests that reorganization is not a panacea, and that for it to be successful in achieving policy integration, other elements, such as appropriate financial resources and retraining of personnel, must be present.

--while in general terms policy integration represents a laudable goal, the costs involved in achieving integration must be carefully weighed.

E. Conclusions and Recommendations

Before considering ways to improve the linkage among the various parts of Colombia's ocean governance system, we review the core elements of that system and their status. They are: (1) general policy pronouncements on the importance of the oceans as a means to increased national development (e.g., Betancur, 1983) and a specific governmental action plan to develop marine sciences and technology to support future economic development efforts in the ocean and coastal zone (DNP, Plan de Desar., 1980); (2) a principal maritime agency having responsibility for a significant number of ocean science activities--DIMAR; (3) a coordinating commission made up of representatives of agencies involved in ocean activities--CCO; (4) a special fund to support new ocean science and technological activities--FONDEMAR; and (5) an array of other agencies conducting activities which are, in one way or another, connected with the oceans or the coastal zone--e.g., INDERENA, INGEOMINAS, COLPUERTOS, CNT, etc.

As discussed earlier, the 1980 plan outlined an ambitious program to build Colombia's scientific and technological ocean capability. The plan appears to have the general support of most of the ocean organizations of the country and, consequently, has provided a general sense of direction to the various components of the Colombian ocean effort. Parts of the plan, however, have yet to be implemented (Steer, pers. comm., 1983).

DIMAR, as the principal maritime agency of the government and the agency with some coastal management responsibilities, is the only government organization totally concerned with the ocean. Both its explicitly assigned ocean and coastal missions and its implicit responsibility to encourage ocean resources development in Colombia are large and important responsibilities. The enthusiasm and technical competence of the staff of DIMAR has made it possible for the agency to go a long way toward meeting its ambitious goals. However, as we discussed earlier, the staff and budgetary resources of the agency are incommensurate with its broad mandates, and the agency, moreover, has virtually no direct leverage over the program directions and resources of the ocean-related units in other ministries, such as INDERENA and INGEOMINAS. Only through exercise of its influence as coordinator of CCO can DIMAR seek to affect the activities of these agencies. To the extent that the FONDEMAR represented a significant bundle of new financial resources, and to the extent that DIMAR could influence its allocation, some leverage could perhaps be obtained over new programs and new directions of these agencies. However, we understand that FONDEMAR in recent times has consisted largely of "contributions" from the participating organizations; hence, the total amount of money in the fund is probably low as is the influence of any one agency.

CCO, created by presidential decree and working in an area emphasized by the president to be of high importance, was clearly meant to be the principal coordinating and policy-making body for ocean science in the government. An organization such as this can serve as an effective communications device and, on those occasions when its individual members see advantages from it, as a vehicle for improved coordination. However, as currently structured, it is unlikely that the commission could serve as the focal point for the development of new ocean policy initiatives, because of its scientific (rather than socioeconomic development) mandate, because it lacks decision-making

authority over individual agency programs, and because it lacks control over financial resources such as FONDEMAR.

With regard to the other marine-related agencies (e.g., INDERENA, INGEOMINAS, etc.), as we discussed in the first part of this chapter, notwithstanding the inherent importance of their work, ocean matters represent a subsidiary concern in these agencies. There is a low level of staff and budgetary resources devoted to ocean affairs, and ocean activities are located at low levels in the governmental bureaucratic structure.

In our view, the major institutional challenges for improving coastal and marine resources management in Colombia lie in two areas: (1) completion of the work called for in the 1980 plan to develop an improved capability in ocean sciences and technology and to strengthen the major institutions associated with that effort; (2) the creation of additional institutional arrangements and the strengthening of existing efforts to carry forward the new ocean and coastal resources development thrust. Each of these is discussed in turn.

Completion of work in progress to develop an improved capability in ocean sciences and technology.

1. Strengthening of FONDEMAR--It appears to us that regular and predictable annual appropriations for FONDEMAR are of high importance if the key science and technology projects outlined in the 1980 plan are to be satisfactorily accomplished. One approach might be to obtain one half of the annual funding level by means of mandatory assessments from the regular budgets of each of the participating ocean agencies, with the remaining half comprised of new funds from general government sources.

2. Disposition of FONDEMAR funds--The CCO should have greater input into the decision-making process with regard to the approval of projects and programs to be funded through FONDEMAR. CCO should have the overall responsibility for ensuring that FONDEMAR's principal purpose--the improvement of Colombian capabilities in marine science and technology--is achieved.

3. Increased funding for DIMAR--It is our sense that given the breadth and importance of its responsibilities, DIMAR needs to receive an increase in its annual budget. Financial assistance in the operation of the research ships, as discussed below, would be a significant help.

4. Funding of the research ships Providencia and Malpelo--

Clearly, the new research vessels represent an excellent opportunity for Colombia to obtain the additional ocean information and data that are required for many purposes. In principle, the costs of operating these ships should be spread over Colombia's entire ocean program since all of the involved agencies benefit from the research work done on the ships. If a special marine development fund is established (as is discussed below), it would be appropriate to use a portion of that fund for this purpose. In that case, however, careful attention would have to be given to ensuring that research relating directly to the development of marine resources was given appropriate priority in the research program of the ships.

New efforts in formulating management regimes for the development of Colombia's marine and coastal resources.

As discussed earlier, the challenge here is to go beyond the process of laying out a strong scientific and technological foundation for Colombia's future ocean effort. What is needed now is to create a governmental framework aimed specifically at the development of ocean resources to gain a variety of benefits (in the forms of jobs, improved standard of living, foreign exchange earnings, etc.) for the Colombian people. Policymaking in this area must be based on careful assessments of the economic potential of various ocean sectors and on the socioeconomic impacts of alternative courses of action. Obviously, such decisions must be supported by a good scientific and technological data base. But they also must be founded on careful analyses of costs and benefits, potential markets, socioeconomic impacts of specific development projects, and a host of other political, economic, social, and environmental aspects--analyses typically done by planners, lawyers, political scientists, economists, and other social scientists. In addition to this multidisciplinary perspective, because marine development efforts may well

involve difficult choices among competing marine sectors, it will be important to place marine development policymaking at a sufficiently high level in the governmental bureaucratic structure to allow the governing entity or entities to make choices from among alternative development paths.

It is our impression that none of the major agencies involved with marine resources management in Colombia currently has represented on its staff the type of planning expertise needed to carry out the new development challenges. This kind of policy analysis and government investment planning expertise, however, is available in the Department of National Planning. Moreover, the department is located at a high level in the governmental hierarchy, overseeing as it does the formulation and implementation of agency programs. No focal point for ocean resources development, however, presently exists in DNP.

1. Our first recommendation, hence, is that serious consideration be given to the creation of a professionally staffed office of ocean resources management within the DNP. This new office would be responsible for overseeing the formulation and implementation of ocean and coastal programs in the agencies with marine mandates, would be the focal point for long-range planning efforts for the future development of marine and coastal resources, and would shape investment recommendations for the consideration of higher governmental authorities, such as CONPES. More specifically, the new ocean and coastal resources management unit in DNP would coordinate a series of studies to more carefully assess the potential social and economic benefits to be achieved from additional government investments in the two promising areas singled out in this study--fisheries and aquaculture and coastal tourism. The new office would also be responsible for confirming the desirability of embarking on a program of coastal zone management in Colombia and establishing procedures for initiating such a program. We believe that both the specialized experience and background of governmental agencies and the intellectual rigor of institutions of higher learning will be needed in this work. Hence, we recommend that an institution such as the University of the Andes be engaged to assist DNP in portions of this effort.

2. In concert with the proposed DNP unit, we recommend that consideration be given to the enlarging of the Comisión Colombiana de Oceanografía to incorporate a new Consejo Nacional de Desarrollo de los Recursos Marinos y Costeros (a national marine and coastal resources development council) in addition to its already existing national council on oceanography. The new council would serve as an ocean and coastal resources policy coordinating group, would bring together the government agencies in other institutions involved in marine resources development, and would advise the DNP unit on appropriate policy directions. In addition to the government agencies already represented on the CCO, participation from other relevant entities such as the Ministries of Development and Education, and from the private sector involved in ocean and coastal resources development might also be included. As does the existing national council on oceanography, the new marine and coastal resources development council would have the capability to establish technical committees to conduct studies, as appropriate. Given its enlarged mission, it may be appropriate to rename the CCO as the Comisión Colombiana del Mar (Colombian Commission on the Ocean). It might also be advisable that staff support for the new council be provided by DNP, so as not to dilute the scientific and technical emphasis of the staff support provided by DIMAR to the oceanographic component of CCO.

3. The third element in the augmented ocean governance framework that we are recommending involves the creation of a new fund to provide financial support for both the new office in DNP and for specific development projects in the various ocean resources agencies. The new fund would be comprised of taxes raised on the imports of marine resources that could be produced within the country. For example, tax monies collected on imported tuna might go, in part, to INDERENA and to other institutions as part of a program to expand Colombia's own tuna fishing efforts. Such a fund might be called PROMAR since it would serve a function similar to that of PROEXPO.

Our view, then, is that these three actions (creation of the DNP unit, the ocean resources council, and the new fund), coupled with continued interest and policy pronouncements by the President, will form the core of an adequate governmental framework for ocean governance at this time. We see the suggested DNP unit as only a first interim step toward an expanded ocean

effort that could lead eventually to the need for a ministry of the oceans. Studies to be undertaken by the new unit together with the communication, training, and awareness-raising efforts by the broadened CCO would also be crucial in laying the necessary groundwork for such a development. Creation of a new ministry at the present time is probably premature; the costs of such an institutional change would probably not be offset by the benefits. As our interviews with DNP staff suggested, ocean activities have to prove themselves before extensive investments, organizational or financial, are made.

Similarly, we feel that the approach we have outlined is likely to be more effective than the proposal made to move civilian marine resources programs now being conducted within INDERENA (marine fisheries) and within INGEOMINAS (marine geology) under the umbrella of an expanded DIMAR. Rather, we can visualize, as a future second step, the formation of a new civilian unit, which combines the non-military portions of DIMAR with the other ocean resources agencies. In the meantime, we feel that it is more desirable to attempt to find a way to increase the support and emphasis given to the ocean programs of INDERENA and INGEOMINAS within their present institutional frameworks.

4. We recommend that serious consideration be given to the elevation of marine fisheries within the government structure. As discussed earlier, it appears that there is a clear need to raise the marine fisheries function to a higher hierarchical level within the agricultural ministry. Such a move is needed to give fisheries more visibility, more autonomy, and easier access to additional resources. Given the potential that apparently exists for expanded fisheries activity both on the Atlantic and Pacific coasts and possible new developments in aquaculture, we believe the time is approaching when consideration should be given to converting the present Ministry of Agriculture to a ministry of agriculture and fisheries.

5. An ocean awareness educational program should be established in Colombia. Efforts by the government of Colombia to give increased attention to marine resources development should be paralleled by efforts to make the citizens of the country more aware of the importance of Colombia's oceans. The present strong sense of national pride and sovereignty in Colombia's

patrimonial seas should be made more specific by means of programs that educate and inform the people of the country as to the potential wealth contained in the sea. It is recommended that DIMAR, as a representative of the naval forces and the keeper of national maritime sovereignty, and the Ministry of Education would be the appropriate agencies to lead such an effort. These agencies might consider the development of a new set of curricular materials for school children which include ocean and coastal experiences and material. Similar programs are being considered for adoption in both Ecuador and Brazil.

The role that ocean and coastal resources can play in the further development of Colombia remains largely unknown at the present time. The range of possibilities is large and the potential benefits could be many. Colombia can make informed choices among alternative development strategies if it starts now to build the necessary policy analysis and decision-making competence and to create the required new institutional arrangements in the marine resources area. The scientific and technological foundations are being laid. The time for the next step is at hand.

APPENDIX A

LIST OF ORGANIZATIONS VISITEDAND QUESTION GUIDEList of Organizations Visited (May 1983)

1. Meeting with Rear-Adm J. P. Rairan, head DIMAR. (May 2).
2. Meeting with press (El Espectador) at DIMAR. (May 2).
3. Meeting with Adm H. Calderón, head Navy. (May 2).
4. Interview with INGEOMINAS. (May 3).
5. Interview with COLCIENCIAS. (May 3).
6. Meeting with 19 representatives of marine agencies in Colombia. (May 4).
7. Interview with INDERENA. (May 4).
8. Interview with COLPUERTOS. (May 5).
9. Meeting with CEDE (Univ. of Los Andes) (and CIFI). (May 5).
10. Interview with CNT. (May 5).
11. Meeting with CUTMA. (May 5).
12. Meeting with Santa Marta Port Director (DIMAR). (May 6).
13. Meeting with Santa Marta Terminal Director (COLPUERTOS). (May 6).
14. Interview with INVEMAR (Santa Marta). (May 6).
15. Tour of Tayrona National Park/Taganga fishing village by INVEMAR staff. (May 7).
16. Tour of Barranquilla. (May 7).
17. Tour of Cartagena. (May 8).
18. Interview with VIKINGOS (Fish Co.). (May 9).
19. Interview with Escuela Nautico Pesquera del Caribe. (May 9).
20. Interview/tour of CONASTIL. (May 9).
21. Tour of CIOH. (May 9).
22. Lunch Meeting with Almirante Calderón and Lt. Correal, CIOH. (May 9).

23. Meeting with C.I.P./INDERENA. (May 9).
24. Interview with Port Director/DIMAR, Cartagena. (May 9).
25. Interview with Flota Mercante Grancolombiana. (May 10).
26. Interview with INCOMEX. (May 10).
27. Interview with DEPARTAMENTO NACIONAL DE PLANEACION. (May 10).
28. Interview with ECOPETROL. (May 10).
29. Interview with ANPAC (Asociación Nacional de Pescadores Artesanales). (May 11).
30. Interview with CARBOCOL. (May 11).
31. Interview with IFI. (May 11).
32. Meeting with DIMAR (No. 2). (May 11).
33. Meeting with CCO Sec. General. (May 11).
34. Meeting with INGEOMINAS (No. 2). (May 11).
35. Meeting with INDERENA (No. 2). (May 11).
36. Meeting with CNT (No. 2). (May 11).
37. Meeting with Adm. J. Calderon, Navy (No. 2). (May 11).

QUESTION GUIDE

1. FUNCTIONS/ORGANIZATIONS OF OFFICE

- Mission of Office.
- Statutory authority/legal framework.
- For what marine-related laws is entity responsible in formulation/implementation?
- Size and type of staff (background of staff, education, and expertise level).
- Bureaucratic organization--hierarchical authority structure.
- Size of budget, budget trends over time.
- Whence does the budget come?
- Origin of the office, when created, changes over time.
- Likelihood and perceived impacts of future reorganization.

2. GOALS/PURPOSES OF OFFICE--GENERAL

- What is entity attempting to accomplish in the specific office/marine sector?
- Evaluation of past efforts--of specific office, as well as of overall governmental effort on marine resources development.
- Have specific goals been established for your office/sector?
- When and how were these goals established? Through what kinds of processes?
- What goals do you consider to be most important in managing/developing your sector?
- What needs to be done to accomplish these goals?
- Do you think that these goals are feasible/attainable given existing resources?
- Views on long-range potential of marine resource development in general, and their sector in particular.
- What are the major prospects (impediments/opportunities) for attaining these goals? Obtain assessment of current level of:
 - knowledge (data as well as theories).
 - personnel capabilities (a sufficient number of technically qualified people?).
 - sufficient statutory authority--is more legislation necessary?
 - delineation of authority/jurisdiction among different agencies with ocean responsibilities.
 - coordination of administrative effort.
 - funding levels.
 - appropriate leadership.
 - support from higher up in the bureaucracy (e.g., President's involvement).
 - support of industry, other external groups.
- What do you think would be the best method of organization for attaining long-range goals?

3. SPECIFIC PLANS

- What specific plans have been developed for the particular sector? Get copies of them.
- How were these plans developed? Who initiated them? Who was involved in formulation/implementation? History of plan development.
- What policy issues (if any) were posed? How were these issues addressed and by whom?
- What are the major sources of information on which the plan relies? Whence did the data come? Assessment of the quality of the data contained in the plan.
- If the plans are being implemented, how are they working out? If they are not being implemented, why not? (If relevant, seek assessment of:
 - availability of data and state of current knowledge to support the plan.
 - size, nature, and quality of staff effort.
 - adequacy of level of funding.
 - level of enforcement capabilities.)

- What have been the outcomes of the plan so far?
- Satisfaction with the plan. Which institutional/individuals do you think might be satisfied/dissatisfied with the plan? How is this measured? Are beneficiaries clearly identified?
- In what ways do you think that some of these institutions/individuals would like to see the plan changed?

4. RELATIONS WITH OTHER ENTITIES--AGENCIES, ORGANIZATIONS, EXTERNAL GROUPS

- With whom do you interact most often in the course of your work related to X? Form that the communication takes, e.g., periodic meetings, phone calls, etc.
- Have you experienced any difficulties in communicating with the various levels of the organizations involved?
- Have you ever been involved in a formal coordinating activity before? (If yes, with whom? Which agencies/individuals? For what purposes? Extent of success/failure of coordination activity. Why? Any reports?)
- Who are the other key actors/most important people/agencies in this area? Who else would we talk to?
- How are industry and other relevant interest groups (probe for type of interest group) organized? How well?
- Through what channels are their views expressed? How much influence do they have on the formulation of marine policies?

5. INFORMATION/DATA

- What data does your agency collect/report routinely? Get copies of reports/publications.
- Any special reports?
- How are these data stored/disseminated? To whom are they disseminated on a routine basis?
- Have any external (outside of the agency) evaluations of resource potential been conducted?
- (If yes, by whom? What were the strengths/weaknesses of these reports? To what extent were they useful to the work of the agency? Copies of these reports.)
- Are the data that you have available adequate to determine the impact of your programs on resource development? (If no, what other information do you think you need?)

6. RESPONDENT'S BACKGROUND

- What is your professional background?
- What is your role in the office?
- How long have you been in this role? What did you do before this job?
- Have you ever had any formal training in marine resource management? (If so, when and where and who was the sponsor?)

APPENDIX B

WORKING VISIT BY STAFF OF THE PLAN MAESTRO DESARROLLO MARITIMO,OCTOBER 1983, WOODS HOLE

One of the principal facets of the cooperative project with Colombia involved a visit by the Colombian members of the team to Woods Hole from 2 to 20 October, 1983. The members of the team, Commander Rafael Steer, Amparo Ramos, Carlos Robayo, and Carlos Moros, were designated Visiting Investigators of the Woods Hole Oceanographic Institution.

A major feature of their visit was their exposure to the U.S. system of management of marine and coastal resources. This was accomplished through visits to different departments of the Institution and to various government agencies and research groups located in the vicinity. They toured both the Institution and the research vessels, including the submersible "Alvin" and the Environmental Systems Laboratory (ESL), where research is conducted on algae, crustaceans, and molluscs in specially constructed tanks designed to reproduce natural environments.

Meetings were held with a number of individuals in the Institution, including Dr. Paul Fye, President and former Director of the Institution, and Robert Knecht, former Director of Coastal Zone Management at the National Oceanic and Atmospheric Administration (NOAA). These meetings focused on the role of marine policy and the relationship between science and policy, and coastal zone management.

Discussions were also held with officials from government agencies located in the vicinity of Woods Hole. These included the U.S. Geological Survey on the agency's role and ongoing studies of polymetallic sulfide deposits and manganese nodules; the Minerals Management Service (Department of the Interior) on offshore oil leasing; National Marine Fisheries (Department of Commerce) on fisheries management; and the National Park Service on the management of a coastal national park. The meetings focused on agency roles, management systems, legal authority for regulation and enforcement, and the establishment of priorities.

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LIST OF ACRONYMS

Aduana	(Customs)
ANDI	ASOCIACION NACIONAL DE INDUSTRIALES (National Association of Industrialists)
ANPAC	ASOCIACION NACIONAL DE PESCADORES ARTESANALES DE COLOMBIA (Colombian National Association of Artesanal Fishermen)
CARBOCOL	EMPRESA COLOMBIANA DE CARBONES (Colombian Coal Company)
CCO	COMISION COLOMBIANA DE OCEANOGRAFIA (Colombian Commission on Oceanography)
CEDE	CENTRO DE ESTUDIOS SOBRE DESARROLLO ECONOMICO (Center for Economic Development Studies)
CENIPACIFICO	(Center for Technological and Marine Research in the Pacific)
CIFI	CENTRO DE INVESTIGACIONES DE LA FACULTAD DE INGENIERIA (Engineering School Research Center)
CIOH	CENTRO DE INVESTIGACIONES OCEANOGRAFICAS E HIDROGRAFICAS (Center for Oceanographic and Hydrographic Research)
CIP	CENTRO DE INVESTIGACIONES PESQUERAS (Center for Fisheries Research)
CNEXO	CENTRE NATIONAL DE EXPLOTATION DE L'OCEAN (National Center for the Exploitation of the Oceans)
CNT	CORPORACION NACIONAL DE TURISMO (also COLTURISMO) (National Tourism Company)
COLCIENCIAS	FONDO COLOMBIANO DE INVESTIGACIONES CIENTIFICAS Y PROYECTOS ESPECIALES "FRANCISCO JOSE DE CALDAS" (Fund for Scientific Research and Special Projects)
COLPUERTOS	EMPRESA COLOMBIANA DE PUERTOS or PUERTOS DE COLOMBIA (Colombian Port Company or Ports of Colombia)
CONALPES	COMISION NACIONAL DE PESCA (National Fisheries Commission)
CONPES	CONSEJO NACIONAL DE POLITICA ECONOMICA Y SOCIAL (National Council on Economic and Social Policy)
COPESCOL	CONSORCIO PESQUERO COLOMBIANO (Colombian Fisheries Consortium)

CUTMA	CONSEJO COLOMBIANO DE USUARIOS DEL TRANSPORTE (Colombian "Transportation Users" Council)
CVC	CORPORACION AUTONOMA REGIONAL DEL VALLE Y CAUCA (Autonomous Regional Agency for the Provinces of Valle and Cauca)
CZM	(Coastal Zone Management)
DIMAR	DIRECCION GENERAL MARITIMA Y PORTUARIA (Maritime and Ports General Directorate)
DNP	DEPARTAMENTO NACIONAL DE PLANEACION (National Planning Office)
ECAFE	(Economic Commission for Asia and the Far East)
ECOMINAS	EMPRESA COLOMBIANA DE MINAS (Colombian Mining Company)
ECOPETROL	EMPRESA COLOMBIANA DE PETROLEO (Colombian Oil Company)
EEZ	(Exclusive Economic Zone)
FAO	(Food and Agricultural Organization - United Nations)
FONADE	FONDO NACIONAL DE PROYECTOS DE DESARROLLO (National Fund for Development Projects)
FONDEMAR	FONDO ESPECIAL PARA EL DESARROLLO DE LAS CIENCIAS Y LAS TECNOLOGIAS DEL MAR (Special Fund for the Development of Ocean Science and Technology)
ICLARM	(International Center for Living Aquatic Resources Management)
IFI	INSTITUTO DE FOMENTO INDUSTRIAL (Institute for the Promotion of Industry)
ILO	(International Labor Organization)
INCOMEX	INSTITUTO COLOMBIANO DE COMERCIO EXTERIOR (Colombian Institute of Foreign Trade)
INDERENA	INSTITUTO DE DESARROLLO DE LOS RECURSOS NATURALES RENOVABLES (Institute for the Development of Renewable Natural Resources)
INGEOMINAS	INSTITUTO NACIONAL DE INVESTIGACIONES GEOLOGICO-MINERAS (Institute for Geologic and Mineral Studies)

INOCAR	INSTITUTO OCEANOGRAFICO DE LA ARMADA (Oceanographic Institute of the Navy)
INPESCOL	INVERSIONES PESQUERAS DE COLOMBIA, LTDA. (Colombian Fisheries Investment Company, Ltd.)
INTERCOR	(International Colombian Resources Corporation - Exxon Subsidiary)
INVEMAR	INSTITUTO DE INVESTIGACIONES MARINAS DE PUNTA DE BETIN (Marine Research Institute of Punta de Betin)
IUCN	(International Union for the Conservation of Nature and National Resources)
JICA	AGENCIA DE COOPERACION INTERNACIONAL DE JAPON (International Cooperation Agency of Japan)
MITI	(Ministry of International Trade and Industry - Japan)
MPOM	(Marine Policy and Ocean Management Center - Woods Hole Oceanographic Institution)
NMFS	(National Marine Fisheries Service)
NOAA	(National Oceanic and Atmospheric Administration)
OPSA	OFICINA DE PLANEAMIENTO DEL SECTOR AGROPECUARIO (Agriculture and Livestock Planning Office)
OTEC	(Ocean Thermal Energy Conversion)
PLADEICOP	PLAN DE DESARROLLO INTEGRAL PARA LA COSTA PACIFICA (Integrated Development Plan for the Pacific Coast)
PROEXPO	FONDO DE PROMOCION DE EXPORTACIONES (Export Promotion Fund)
SENA	SERVICIO NACIONAL DE APRENDIZAJE (National Apprenticeship Service)
UNCTAD	(United Nations Conference on Trade and Development)
UNEP	(United Nations Environment Program)
UNICEF	(United Nations Children's Fund)
WHOI	(Woods Hole Oceanographic Institution)

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