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REPORT OF THE OCEAN POLICY
RESEARCH WORKSHOP

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REPORT
of the
OCEAN POLICY
RESEARCH WORKSHOP

by
Robert L. Friedheim
Judith T. Kildow

Dulles Airport, Virginia
February 11-12, 1975

sponsored by
Public Research Institute, Center for Naval Analyses
and
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Plans for this Workshop were well underway when, in March 1974, John Hanessian Jr. was killed in the crash of an airliner near Paris. John had been an innovative and moving spirit in this and other efforts of the National Science Foundation to generate knowledge and methodology in the areas of the oceans and technology. His loss is a tragic one both professionally and for those of us who enjoyed his friendship and it is to John's memory that this report is dedicated.

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CONTENTS

	Page
I. INTRODUCTION	1
The RANN transnational program	1
The ocean policy research workshop	2
Ocean policy research: what is it and why is it needed?	2
II. FINDINGS	4
Enclosing the ocean	4
The enclosure movement and policy research	5
Doing policy research within the U.S. political system	5
Policy research	7
Disagreements	8
III. RECOMMENDATIONS FOR POLICY RESEARCH	10
National ocean institutions--processes and perspectives	10
International and transnational ocean institutions--processes and perspectives	11
Transportation and communications	14
Exploitation and management of ocean resources	14
General resource problems	15
Mining and energy	15
Living resources	16
Environmental protection	16
Scientific and technological information: needs and uses	17
IV. PRIORITIES	19
V. APPENDICES	21
A. Ocean policy research workshop participants	21
B. Background paper: Marine Policy Research Needs 1975	24
C. List of workshop papers	41
D. Reports of the working groups	42
Working Group I - Ocean science and technology	44
Working Group II - Ocean resources	46
Working Group III - Ocean law and institutions	48

I. INTRODUCTION

A. The RANN Transnational Program

In February 1975, a group of scholars, analysts, and U.S. Government officials with interests in or responsibilities for ocean policy were asked to attend a workshop sponsored by the RANN (Research Applied to National Needs) Directorate, Office of Exploratory Research and Problem Assessment, National Science Foundation, and managed by the Public Research Institute of the Center for Naval Analyses, an affiliate of the University of Rochester. The purposes of the workshop were to (1) assess "the state of the art" in research relating to ocean policy, especially that research which deals with international and transnational problems arising out of transformations of ocean scientific and technological knowledge; (2) determine the degree of consensus about the status of ocean policy among knowledgeable observers; and (3) propose to RANN/NSF a research agenda and appropriate methods for carrying out that research which would allow the United States to create an ocean policy based upon facts, knowledge of available options, and an understanding of the process of their own and others' decision-making.

Thus, the workshop was explicitly oriented toward policy analysis and applied social science and not toward improving all knowledge relating to the oceans. The only policy problems excluded from the workshop's deliberations were those problems not within RANN/NSF's mandate. In particular, the workshop did not consider problems that are primarily the responsibility of the Department of Defense.

NSF/RANN sponsored the Ocean Policy Research Workshop as one in a series of evaluations of particularly important foreign policy problem areas strongly affected by changes in science and technology. The program in general and the particular areas, including the oceans, were recommended to NSF as appropriate subjects for sponsorship of research relating to national needs by an earlier workshop held in 1973.* In that report the participants proposed that NSF/RANN create a "RANN international" that would sponsor policy research projects of interest to a number of government agencies with mission responsibilities in international affairs. They would deal with functional problems cutting across single agency lines and be broadly relevant to U.S. policy; but no user agency would be asked to endorse, direct, or veto the sponsored research. On the other hand, the research sponsored would not deal with shortrun problems more appropriately handled in-house but rather middle and longer run problems more amenable to analysis by outside experts.

*Workshop on Priority Research Needs on Technology Related Transnational and Global Policy Problems, Brookline, Mass., March 7-8, 1973, jointly sponsored by MIT and NSF.

B. The Ocean Policy Research Workshop

The Ocean Policy Research Workshop met on February 10-11, 1975 at the Dulles Marriott Hotel, Dulles Airport, Virginia. The participants were chosen to reflect a representative range of those interested in public ocean policy research. This included analysts and scholars from universities and specialized research institutes, government decision-makers from the mission agencies with ocean responsibilities, and government officials specializing in research management.

In constructing the invitation list there was an attempt to balance participation between knowledge "creators" -- researchers and analysts -- and knowledge "users" -- government decision-makers. There was also an attempt to balance senior experienced ocean people with younger colleagues, some of whom, it was hoped, would contribute new, fresh ideas. Forty-one people, plus workshop staff attended (see Appendix A for list of participants).

In order to use the scarce time expeditiously, a number of papers were commissioned and distributed in advance. The main background paper assessing the state of the art was written by Prof. Judith Tegger Kildow of MIT (Appendix B). There were shorter, more specialized papers on living resources, energy economics and the oceans, ocean mineral exploitation, ocean science and its relation to ocean policy research, the international political context for ocean decision-making, international ocean law, transnational ocean institutions, problems of U.S. ocean decision-making, and an evaluation of ocean study institutions (see Appendix C for titles and authors of papers, which are available in Vol. II of this report for limited distribution).

The Workshop began with a plenary session which introduced and discussed the basic problem. The participants then broke up into three working groups: (1) ocean science, technology, and environment; (2) ocean resources; (3) national and international ocean law and institutions. The reports of the working groups were then submitted to a final plenary session which revised and integrated the specialized recommendations (see Appendix D for descriptions of proceedings of the Working Groups).

C. Ocean Policy Research: What is it and why is it needed?

An "ocean community" exists in the U.S. Its modern history began with the realization in the early 1960s by the Interagency Committee on Oceanography that the U.S. had an enormous investment in the oceans and the future would bring increasing dependence on the resources and uses of the sea. The work of the Marine Council and the Marine Commission in the late 1960s and more recently the establishment of the National Advisory Committee on the Oceans and Atmosphere (NACOA) and the Seante's National Ocean Policy Study (NOPS) and the convening of the third UN Law of the Sea Conference--the largest multi-lateral conference ever held--brought larger and larger segments of the government into

making policy about the oceans. There was also a growth of interest among U.S. citizens and the professional interest among scholars and analysts concerning the future of the oceans. All these people form a community--but it is one searching for boundaries. Because of the diversity of the public and private interests involved, it would be impossible to state a precise definition of ocean policy--much less ocean policy research.

Still, some generalizations can be made. Ocean policy research relates to problems encountered by the various U.S. government agencies that have responsibilities in the oceans.* These can be characterized as geographic, functional, and/or institutional. Thus, coastal zone management, management of the living resources of an economic zone, controlling mineral and economic resource development in an economic zone, as well as allocating responsibilities for the international area, are viewed in a geographic context. Other problems that government agencies must deal with are functional problems without strict geographic constraints: ocean defense problems, ocean science policy, marine technology transfer, environmental protection, and ocean transportation and communications. These geographic and functional problems must often be resolved within a third context--laws and institutions, which have a feedback effect on the quality of the decisions made.

Ocean policy research can also be characterized by the type of product sought by the policy-maker. Facts relevant to ocean problems--unadorned by any analysis--are usually requested by policy-makers. This has been called "policy-related research." The problem here is to determine just which facts are directly relevant to a particular policy-maker and which are part of the general corpus of knowledge--although many of these may indeed prove extremely important and relevant later. But the sponsoring agency cannot afford to contribute to the general body of knowledge.

A second type of study, the evaluation of alternatives available to the policy-maker and their associated costs, is obviously relevant. It is the study of the substance of policy decisions per se.

A third type of research relates to the processes by which policy is made. Knowledge of how the agency or government department in question--and comparable agencies in other governments or departments--make policy is useful to the policy-makers in evaluating his own effectiveness.

*There are of course also a large number of private domestic institutions dealing with the oceans. In this report we are concerned with these only to the degree that they interact with or affect U.S. government agencies' -- or public -- ocean policy.

A fourth type of research with policy implications is the assessment of what is the most desirable state. This type is explicitly normative and it specifies what in the opinion of its author should be. All these types of research could be organized and presented to policy-makers within a conceptual framework for solving ocean management problems. Such a framework might recognize stages in policy development. The following would seem appropriate:

- (1) Research - policy and other
- (2) Planning
- (3) Action to: (a) Negotiate and obtain agreement; (b) Set standards and criteria; (c) Create institutions; (d) Monitor changes, potential threats, programs and policies, and adherence to agreements; (e) Attain and enforce standards; and (f) Gain acceptance.

It will be seen in the next section that producers and consumers of knowledge are not always in accord on what should be studied, how it should be studied, and what obligations should exist between producer and consumer.

II. FINDINGS

Since policy research is so intimately tied to the policy problems being examined and the context in which policy is made, the discussions among the participants ranged widely over all aspects of ocean policy and ocean research. There was broad agreement on nine points, distributed in four general categories: (1) the nature of the basic historic process of enclosing the oceans; (2) the types of policies that seem to flow from this process and the usefulness of research thereon; (3) the specific problems of doing ocean policy research in the context of the U. S. political system; and (4) the difficulties of and need to improve policy research and the institutions which are charged with doing it. In addition, there were also a number of general areas where fundamental disagreements existed among the participants. These were often as revealing and as important to users and practitioners of policy research as our agreements.

A. Enclosing the Oceans

1. The participants recognized that the world is in the early stages of an enclosure movement that will eventually change the legal and political status of much, if not all, of ocean space. Until recently users of the oceans were content to allow most of ocean space to be used as common property owned either by all the peoples of the world or none. In the foreseeable future much of ocean space will be put under the jurisdiction of political entities, national or international.

Since nation-states are still the most powerful components of the world system, they will probably be the greatest beneficiaries in the race to control ocean space. They need only expand their jurisdiction further and further from their shores.

Why is ocean space being "fenced off" after centuries of being treated as common property? There are three main reasons: (1) Developments in science and technology have allowed mankind to occupy ocean space more widely. (2) Treating ocean resources as common property is inefficient compared to a single legal entity assigning exclusive rights to their use. (3) Many developed states who have only recently joined the international system claim that under a common property system, the rich and powerful control an unjust share of the ocean's wealth, and therefore the system must be changed.

Those who have benefited from the traditional arrangement to go where they please and do what they please as long as they do not interfere with the rights of others--maritime transport industries, trade routes, fishing industries, major navies--deplore the breakdown of a doctrine which has served them well. The beneficiaries of the enclosure movement are mainly a new generation of ocean exploiters--seabed miners, oil men, and perhaps ocean conservators who would use assigned jurisdictional rights to protect the health of the oceans.

B. The Enclosure Movement and Policy Research

2. Although we are witnessing a longterm historic trend and can already see the general direction it is taking, this does not mean that the entire process of enclosure is foreordained. If that were the case there would be no need for ocean policy or policy research. The question of how mankind is enclosing the oceans is important. There are many options and alternatives available. It is the task of ocean policy research to reveal for the policy makers the benefits, costs, and risks of alternatives.

3. The most obvious manifestation of the enclosure movement is the trend toward establishing a 200-mile zone of coastal state jurisdiction. This could be accomplished by either the Third UN Law of the Sea Conference and/or by unilateral action of coastal states. Precisely what the extent of coastal state powers within this region will be, what rights others will have there, what practices should be followed for maximum effective use of the area and its resources, and what the coastal states should do to preserve the environmental health of the area are already subjects of policy-making.

As will be seen in this Workshop's specific recommendations for policy research, the drive toward control of a 200-mile offshore zone has generated a demand for a substantial number of studies on how the United States and other coastal states might use and administer the zone.

C. Doing Policy Research Within The U.S. Political System

4. There was broad recognition among Workshop participants that resolution of ocean use problems within the U.S. political system is especially difficult. The ocean use and management problems that the U.S. faces are similar in substance to those others will

face in using their ocean space; but the way we are handling them reflects the complexity, vagaries, and peculiarities of American political decision-making. Most ocean decisions have middle and long-run rather than short-run consequences. The oceans will not dry up nor will pollution destroy their health during any one Presidential Administration. As a result, Administrations tend to neglect long-run problems of ocean use or place responsibility for them in the middle rather than the top of their bureaucracies and spread out responsibilities among many agencies and departments, all of which have a segment of the total responsibility for ocean policy. This often means a lack of cohesion and direction and permits a heightened degree of bureaucratic cross-purposes and infighting. This is paralleled by the great diversity and divisiveness of the client groups of these agencies. Thus a policy that seems to make good sense economically may become impossible to implement.

The structure of the ocean decision-making system in the United States should influence how students of ocean policy decisions structure their research projects. If ocean policy researchers don't take into account the nature of that decision-making system, their conclusions, no matter how sound within their own special area of knowledge, will probably have little impact on policy.

5. The Workshop concluded that there was a strong need for a coherent national ocean policy. This would consist of substantive ocean policies that would use American ocean assets efficiently and justly, and have a more centralized coordinative structure that would oversee their implementation. It was strongly felt that we probably could not achieve the former without the latter. To create such a policy requires leadership at the highest level. The President must be more willing to deal with ocean problems himself or delegate them only to officials of considerable seniority. The Congress must be willing to pass the legislation to reorganize the Executive and encourage it to implement the types of policy most likely to maximize U.S. benefits from use of the oceans. Congress could then more easily oversee U.S. ocean policy.

Workshop participants noted the clear precedent in recent American political experience for an Executive structure that had a record of success in molding ocean policy; the National Council on Marine Resources and Engineering Development of the years 1966-71. It was generally concluded that a super ocean agency would be unwieldy, unfeasible, and unwise. Virtually every ocean problem has its counterpart on land and to create two agencies to solve each would be dysfunctional; it seems better to have a coordinative rather than super administrative ocean body to give leadership and coherence to policy. Many participants felt that now is an especially propitious moment to establish a marine council-like organization because Vice-president Rockefeller, who is the most likely office-holder to chair such an institution, has the obvious qualifications, attributes, and interests to make a success of achieving a rational ocean policy.

The participants also believed research could help Congress and the Executive in planning the restructuring and in choosing better policy alternatives. While research is not a substitute for political will, it can be a useful supplement.

6. Because this is an era when the uses and abuses of the oceans are changing so rapidly, there is greater need than ever before for policy research to assist policy-makers in this area. But sponsorship of policy research by Congress and the Federal administrative agencies is on the decline. It is particularly regrettable that the program in NSF which sponsored this Workshop is to be terminated, especially since there is no indication that any other office within NSF will pick up the responsibility for sponsoring ocean policy research. We urge strongly, if the decision to terminate this program is irrevocable, that another office with ocean responsibilities in NSF be authorized to be the sponsoring agency for ocean policy as well as oceanographic research. The hope was also expressed that other funding agencies such as the Sea Grant Program in the Department of Commerce request more funds for the sponsoring of ocean policy research.

From early indications, the Sea Grant International Program is off to a good start and might be an appropriate agency to take over some responsibility for sponsoring research on transnational and international ocean problems. Participants felt that the money appropriated for ocean policy research ought to be a percentage of the federal ocean program. The federal ocean program FY 1975 is slightly under \$800 million. Some participants suggested that perhaps 1%, or \$8 million, might be devoted to investigations into the wise use of the remaining \$792 million. Present funding for ocean policy research is far below this figure, and all participants agreed that more adequate funding is needed. Participants also wanted this request for funding and the list of needed research to be specifically conveyed to the Congress and especially those involved in the study of national ocean policy.

D. Policy Research

7. Modern ocean policy research has often been done at specialized ocean-related institutions, mainly recent creations developed in association with universities, oceanographic institutions, and federal contract research centers. Some, in addition to their research functions, have educational and degree-granting functions as well. Because of the often comprehensive nature of ocean problems, requiring expertise in a number of fields and requiring amalgamation of different insights in order to be policy-relevant, such centers perform an especially useful role in the organization, management, execution and publication of ocean policy research. It was agreed that such institutions perform a valuable function, and that they deserve to be sustained and supported at a higher level than at present because future ocean research needs their expertise and their organizing ability.

However, two caveats were put forth: (1) it is essential that research be truly policy-relevant and the benefits of the research be made apparent to decision-makers, and (2) these institutions exercise better quality control of the work that they sponsor. This should be primarily self-criticism to improve the sometimes superficial or slipshod work that results from a rush to publish before events become out of date. To be known in the future as centers of marine policy research excellence, existing ocean institutions must move

beyond narrative studies to sponsor second-generation analytical work that can, in sophisticated fashion, delineate policy options, with their associated costs and risks, as well as place these in their social, political, and economic context.

8. It was noted at the Workshop, as it had been noted in the predecessor workshop, that it would place an impossible burden upon the university and special ocean institutions researchers to provide research support on short-run policy problems for the mission-oriented agencies. Such outsiders cannot replace an in-house capability for gathering immediately needed facts and short-run analysis. But outside research organizations can provide services which are essentially non-competitive with in-house research organizations. However, this puts a very special burden upon the ocean policy research community. It must be cognizant of the need to deal in middle-run and long-run ocean policy problems. If the community is to make a significant contribution, it will be here. This necessitates being future-oriented in research perspective. Solving the problems of the past or second-guessing current policy decisions will do policy-makers little good when they ask for assistance on understanding the middle and long-run consequences of the actions they take today. This will require more sophisticated analytical techniques, especially forecasting and systems approaches to understanding policy problems.

9. There is a real problem of lack of communication between policy-makers and policy researchers. Ways have to be found to bring the producer and potential consumer of research together and to get the research used. It is to be hoped that the re-establishment of science advisors available to the President will help reverse this trend. It has been a trend peculiar to the United States; in other countries there is a growing reliance upon technical and scientific advice from experts. The difficulties in communicating between ocean expert and ocean policy-maker is itself a fertile subject for policy research. The purpose of such research would be to improve communications and make ocean policy research more usable. A number of approaches here seem fruitful: studies of the effectiveness of various extant communications channels, studies of the basic attitudes of members of both communities, studies of how policy-makers use outside advice, and where the outsider fits into the policy-making process.

E. Disagreements

In the two and one-half days of spirited debate and discussion numerous disagreements arose not only about what is wise ocean policy but also about what research should be sponsored, how to do the research, and where or in what type of institution policy research can be done. Below are five of the major areas of disagreement.

1. Will achievement of a comprehensive law of the sea treaty make a difference in our future ocean use orientation or will we (and the world) be forced to cope with the same

general problems with or without a treaty? This problem affects not only the way we must think about and plan for future ocean policy but also may have an important effect upon ocean policy research. Strong feelings were expressed on both sides of the question.

2. Is the university the place to perform policy research? Some participants felt that the university or even a specialized university ocean policy center was too physically remote from the centers of decision, too slow to respond, and too abstract in its orientation to do policy makers much good. Others pointed out that the U.S. government has relied upon its universities in the past for valuable research work, including policy work, and that universities can bring some valued assets to the performance of policy research, most notably objectivity and accumulated expertise.

3. Should ocean problems be treated as unique research problems or should they be viewed primarily as extensions of land problems? The answer a researcher gives this question will importantly effect the way he or she goes about analytical work. Some participants pointed out that, for example, because most ocean pollution originates on land or that the energy crisis or world energy problems are not just "ocean" problems, the ocean components of these and other problems must be viewed in a larger context for the most adequate analytical treatment. On the other hand, other participants pointed to many of the features unique to ocean problems. While not denying the existence of a larger context to many problems, they thought that most ocean problems could be examined alone or as a acknowledged subset of the larger problem.

4. Should most ocean policy research be pursued via interdisciplinary teams or by researchers who work strictly within a single intellectual discipline? Some of the participants, especially those whose professional experience was economic, felt that they could not take on "normative" questions, theirs being a "positive" science. They also claimed that the quality of the work would be better if pursued within a single discipline. On the other hand, other participants felt as strongly that to pursue ocean policy questions only within a single discipline would made the resultant ocean policy advice sterile and unrealistic because the answers received would be without context or given without consideration for other factors of equal importance. For them, the interdisciplinary approach achieved a proper blend of expertise and a proper balance in consideration of the overall problem.

5. Can policy research results prove equally satisfactory to researcher and client? Is there a fundamental conflict between what policy makers want supplied and what researchers are prepared to provide? Policy makers are oriented toward the immediate and tend to discount research results that are oriented toward the middle and long-run future. They often view the long-run concerns, the future orientation of the academic researcher as too abstract to be of much use to them. The researcher, on the other hand, often claims that the policy maker is too often blinded by the immediate and does

not think of the context of the problem, therefore often choosing the wrong option. Many instances of this basic conflict in view points occurred in the Ocean Policy Workshop in plenary session as well as in the third working group.

III. RECOMMENDATIONS FOR POLICY RESEARCH

The participants in the workshop enumerated hundreds of suggestions for marine policy research topics. These topics can be roughly organized into the following categories:

1. National (U.S. and foreign) Ocean Institutions--Processes and Perspectives.
2. International and Transnational Ocean Institutions--Processes and Perspectives.
3. Ocean Transportation and Communication.
4. Exploitation and Management of Ocean Resources.
5. Ocean Environmental Protection.
6. Ocean Scientific and Technological Information--Needs, Uses, and Impact.

These categories contain problems about the policy-making process itself, as well as about specific functions which the policy process must address.

While some research has been done or is currently underway in several of these categories, the topics recommended in the following pages were thought to need attention. The order in which they are listed does not imply any notion of priority.

A. National Ocean Institutions--Processes and Perspectives

The fragmentation of marine policy-making in the United States has placed grave difficulties on defining a set of national priorities that serve not only for national policy making but also provide a unified negotiating position for any international negotiations--including, but not limited to, the Law of the Sea negotiations.

There is a compelling need to understand better the nature of the international policy-making machinery of our own nation. Here we find a rapidly changing set of circumstances with an inadequate set of machinery to deal with them. For example, how does the federal government assure that constituencies with vested marine interests are represented in the policy-making process, while at the same time assuring that agencies representing their constituencies do not become servants of their constituents to the detriment of the general public interest. That, in fact, is what has happened in too many cases and will continue to happen until there is better understanding of how organized private interests, unorganized private interests, and public interests can be balanced and served in equitable

fashion. At the national level certain activities such as minerals developments have changed significantly in size and importance over the past years; yet the policy-making machinery regulating and representing them has not changed. The numbers and range of certain activities have changed the whole nature of the system in which these activities operate so that there are overlaps, conflicts, and competition. Yet, the federal regulatory system has not changed to optimize the situation or to regulate activities best to serve national interests. Thus, coupled with the need to fund research for improved international machinery, there is a need to encourage research that would lead to an understanding of the flaws in the national regulatory system, that both impact upon and are impacted by the international system. These are the topics selected for potential research in category A:

1. How ocean decisions are made in other nations.
2. Forecast of levels and types of ocean conflict after the Law of the Sea Conference.
3. The operation of national ocean institutions transnationally.
4. Resolving the problems of the geographically disadvantaged states in gaining access to and use of the seas.
5. Current structure and processes of U.S. ocean policy decision making; alternate organization: (a) Management of the International area; (b) Management of the Economic Zone; (c) Management of the Coastal Zone (federal-state relations, allocation of benefits and costs of development of coastal areas).
6. Adequacy of current U.S. ocean policy processes in the post LOS era (U.S. decision structure re international aspects of oceans evolved from LOS negotiations; is it appropriate for formulating general ocean policy?)
7. Problem solving management approach to U.S. ocean decision making. Is it feasible to operate a non-zero-sum system?
8. The "ocean community"--a study of the participants in the ocean political process.
9. The relationships among legal and technological elites in the U.S. policy process.
10. How information is generated and used in the U.S. policy process.
11. Foreign states rights and intentions for operating in: (a) International Area; (b) Economic Zone.
12. National enforcement problems in (a) International Area; (b) Economic Zone; (c) Coastal Zone.

B. International and Transnational Ocean Institutions--Processes and Perspectives

While Law of the Sea negotiators struggle to reorganize certain aspects of international decision-making about the oceans, the established process on the international level is still almost totally decentralized. For the most part substantive policy is

made by individual nations either as coastal states or as flag states of the myriad vessels and structures that employ the ocean.

"The difficulty is that the policy-making process has not changed in any substantial way, except to become more difficult of operation as the number of formal participants has dramatically increased, but the context otherwise has altered substantially. Technology and use are capable of very significant impacts on the ocean environment, on the resources it contains, and on land-based communities. A healthy ocean environment, plentiful and accessible resources, and uncongested coastal communities are in danger of becoming scarce. As a result, conflict is emerging over allocation of the use thereof or over protection from harm from the activities of others in their use of the ocean. The striking interdependencies of virtually all activity in the ocean are in almost complete contrast to a political system in which the decision-making capacity is fragmented among a very large number of formally independent units, many of whom must occur before effective policies can be established."*

An additional problem at the international level is the "old crony" nature of the "club" of old friends and professional colleagues across national boundaries and within international organizations who have dictated policies up to now. Valuable information transfers and significant decisions have resulted from these informal mechanisms. However, as the issues have grown in size and complexity, this useful system of decision-making has become inadequate.

One of the resultant problems is that despite the change in international circumstances, there is a tendency to ignore what is really happening and to do research for a normative international life. For example, extended national jurisdiction over ocean space leaves less area for international institutions to regulate and gives much more power to national states to make decisions about the most critical areas of ocean activities--resource development (except manganese nodules), pollution control, ocean transportation and scientific research. Yet lawyers and academicians continue to design international institutions which assume quite the reverse tendency. While many may wish for greater internationalization of the oceans, that is not, in fact, what is happening. Moreover, they often are designing these systems for creating a more perfect abstract international system, not practical arrangements for managing the oceans. There is a need to blend what is with what will be, integrating what is already known with some innovative ideas for new institutions with other types of management systems.

*William Burke, "Memorandum on Research Concerning International Marine Affairs," MIT Workshop Report, p. 64.

The usual policy processes on the international level appear to be incapable of coping with the future problems arising from the increasingly intense and significant activities taking place in the oceans. The means for establishing a process that is capable of this task needs to be investigated and deserves very high priority in decisions on available research support.

Because there is growing recognition of the dynamics of international and transnational ocean institutions, there were an unusually large number of research topics suggested. Among them:

1. International confrontation over wealth distribution (New Economic Order).
2. Implications of forming government corporations or entities to exploit the seas.
3. Diplomacy--multilateral and bilateral--and future negotiations on ocean resources.
4. An international coast guard--composition, missions, etc.--and its desirability.
5. The establishment of global navigation networks.
6. Regionalism as an approach to resolving problems of utilization, allocation and distribution of ocean resources, and to ocean use rights.
7. Adequacy, relevancy and capacity for change of international and transnational ocean-related institutions.
8. Development of better methods of international decision-making.
9. The impact of various ocean regimes on world stability.
10. Expectations of foreign diplomats in shaping the law of the sea.
11. Determination of the "real value" of the bargaining chips in the LOS negotiations.
12. The consequences of non-agreement on a comprehensive and universally applicable law of the sea treaty -- and alternatives in case of non-agreement.
13. Presuming achievement of a successful law of the sea treaty, what would be acceptable interim measures that could be enforced? How could relations with states not assenting to an LOS treaty be managed?
14. New approaches for solving marine-related disputes.
15. Demarcation of economic and international zones; technological and policy problems and costs.
16. Participation by private parties, e.g., corporations, in international forums.
17. The role of bi- and multilateral aid in international ocean affairs.
18. Ocean arms control and disarmament.

C. Transportation and Communications

Ocean transport and other communications cut across all policy-related matters and bear upon all issues. Heavy emphasis needs to be placed upon policy research related to ocean transportation systems and the needs and locations for future transport.

Very little social science research related to transportation and communications has been done in the past. These topics were selected as the most pressing:

1. Needs, capabilities and plans of foreign states in ocean transportation policy.
2. Implications for port development to accommodate new shipping patterns and new equipment.
3. New regulations for ships of the future--size, speed, cargoes, tank size, etc.
4. Navigation problems in the light of growing congestion and changing ship designs.
5. A reevaluation of the marine insurance industry and conference system.
6. International cost comparisons for international shipping; (a) Projections of supply and demand; (b) Under conditions of imposed "rents."

D. Exploitation and Management of Ocean Resources

Although the oceans have been a source of resources for many societies throughout the ages, the dwindling supply of natural resources on land has impelled the human community to turn increasingly to the seas. As technological development has produced more efficient methods of exploiting ocean resources and as increasing numbers of nations utilize these resources, conflicts have arisen and will continue to arise over jurisdiction and ownership of ocean resources. This particularly is the case because the capabilities for exploitation of ocean resources are so widely divergent among nations.

Unlike land resources, the resources of the sea have a common-property quality, leaving ownership at once to all and to none. The growing ability to deplete resources adds to the jurisdictional problem one of conservation and management of the resources--a problem of world-wide significance. Yet so little is known about the living systems of the sea and how properly to allocate their uses that bases for measures such as gear restrictions, limited entry and quota are not adequately understood. Secondly, political management systems based on the available scientific information have been unsuccessful to date, both with living and with nonliving systems, so that work is obviously needed to establish viable resource management systems for the oceans in all of the zones--coastal, economic and international. The resources of greatest value and hence greatest concern at this time are fish, oil, nodules and other hard minerals, as well as the water itself.

Events to a considerable degree will dictate who will manage the resources in various areas of the oceans. All participants in the workshop recognized the clear trend toward

putting those areas with known or potential resources under national jurisdiction. The 200-mile resource zone appears to be a present reality. For all practical purposes this leaves only manganese nodules and other deep ocean resources, and sometimes highly migratory species of fish, such as tuna, under international jurisdiction. Research topics can be divided as follows: living resources, mining and energy, general resource problems.

a. General Resource Problems

1. Market and management systems for development of ocean resources.
2. Capital formation and ocean enterprise.
3. Government entities as exploiters of the seas in national and international areas.
4. Econometric analysis of supply and demand for resources located in international zones, economic zones and in coastal zones.
5. Exploitation of the natural resources of the Arctic, Antarctic and other special areas.
6. Implications for land-based products and industries of the development of ocean resources--living and nonliving.
7. Alternative systems and their applicability to the development of marine resources, living and nonliving, e.g., joint ventures, consortia, national corporations, international corporations, etc.
8. Problems incurred by common property resources--costs, benefits, rents.
9. Land use practices applicable for ocean management systems in international, economic and coastal zones.
10. Complementary uses of ocean resources and activities--energy, minerals, living resources--in international, economic and coastal zones.
11. Resource allocation systems and their differential impacts (leases, royalties, etc.).
12. Implications of increasing public ownership of natural resources.
13. Impact of policy alternatives on U.S. resource industries and national economies as they relate to oil, fishing and other resources.

b. Mining and Energy

1. Manganese nodule exploration without an operational international agency--implications of unilateral action and of no action.
2. Plate tectonics and potential effects of locating resources.

3. Optimal rate of exploration and exploitation of Outer Continental Shelf (OCS).
4. Regulation of offshore structures (platforms, pipelines, cables, etc.).

c. Living Resources

1. Aquaculture and its potential as an additional source of protein.
2. Maximum sustainable yield as a general policy guide--good or bad conservation policy?
3. Special legal arrangements for marine mammals.
4. Management of 200-mile fishing zones, and the special problems of coastal, pelagic and anadromous species.
5. Enforcement problem (see also recommendations #11 and #12 under category a.).

E. Environmental Protection

Environmental protection of the ocean must stand as a separate category because the problems transcend manmade borders. Because the oceans influence the climate and weather of the land, concern must be paid to the continued viability of this resource not only for its own sake but because of its broader environmental impact. The influx of chemicals and other pollutants (often from land-based sources) into the sea have a feedback effect on the health of living systems that inhabit the land areas of the world.

Direct ocean uses such as the actual exploitation and development of mineral resources (oil, nodules, etc.) also create hazards to the marine environment, the impact of which needs to be better understood. As with resource management, environmental management requires viable political systems which satisfy the needs of all nations involved. With the diverse levels of development and accompanying diverse needs of so many nations, enforcement of any standard--much less a uniform standard--becomes a problem. The following were suggested as appropriate subjects to study:

1. Analysis of secondary and tertiary effects in environmental impact statements.
2. Baseline and global monitoring studies.
3. Measurement of the impact on living resources by exploitation of the mineral and energy resources of the economic zone.
4. Environmental hazards of oil production.
5. The effect of elimination of vessel source pollution.
6. Problems and solutions in the marine transportation of substances such as liquid natural gas (LNG) and bulk chemicals.

7. Enforcement of international environmental protection regulations--problems and solutions; a study of alternative enforcement schemes and their effect on costs and innovation.
8. Control of landbased pollution through international devices.
9. A scientific evaluation of the ocean as waste dumping ground: how does it compare with alternatives?
10. The degree of responsibility of governments to salvage or clean up major marine disasters, e.g., high seas blowouts if oil production occurs at 3,000 foot depths.
11. Evaluation of port-state control over vessel pollution.
12. The potential "double standard" problem post-LOS III: should developing states have different environmental protection requirements from developed states?
13. Desirability of a global treaty on marine environment; alternatives to a global treaty.
14. Probable responses of coastal states and shippers to national or international discharge or construction standards.
15. Externalities in marine developments and their effects.

F. Scientific and Technological Information: Needs and Uses

It is frequently said that knowledge is the key to power, but we do not understand their relationship with any precision. Information problems are inherent both at the national and international level.

At the national level there are questions of how information is gathered and distributed, the reliability of the information, the relationship between information gatherer and information user.

In addition, access to information itself is a sensitive subject. There are growing difficulties in handling information which may be militarily or commercially sensitive. In addition, the existence of verifiable and believable data may be centrally involved in the resolution of conflicts that could arise out of the application of new technologies. For example, there is the question of what information should be in the public domain. There is some question about the necessity for exploratory activities to be carried out by private mineral companies rather than public bodies. Mineral companies argue that the expense of developing the technologies and the degree of precision necessary for the decision to bid on a lease must be in the hands of the private company for the company to have any incentive to participate in the activities. On the other hand, reliable information about the technology requirements is essential for government decision-makers to protect the public interest in negotiations on this issue. In addition, the generation and use of

information needed for policy decisions is often difficult to understand when contributed by the generator of the information, usually a scientist or engineer, and is even more difficult to use when knowledge is incomplete or is dominated by intrinsic uncertainties.

There is a grave difficulty in cataloguing and making known what information exists in the numerous areas and then distributing it to those who need the information, and most significantly assuring that those who need the information know how to optimize the use of it. As with resources, we find the same problem in the utilization, distribution and management of information.

On the international level among the most pressing and yet least understood issues which must be addressed with some urgency are those relating to the impact of the ocean activities on the developing nations of the world. Many developing states fear that their lack of information and understanding of marine science and technology and the constant increase in ocean capabilities of developed states is widening the already substantial development gap between them. The developing states have signalled they intend to change current circumstances. These questions are by no means only ocean-related, because they include problems of equitable distribution of wealth and resources, participation and representation of these nations in international decisions affecting their current and future welfare, and the utilization of new technology to benefit these countries.* A particularly sensitive question, but one which must be investigated, is how domestic U.S. decisions affect developing countries and the possibility of eventual international regulation and management of particular resources. International acceptability must be a criterion for consideration in technical decisions that are now made essentially on the basis of efficiency or optimum performance criteria, the foundations for the private enterprise system in the United States. Deep ocean mining is probably the most obvious pending issue in this area, since negotiations are centered on developing an international regulatory body to oversee such activities in the Law of the Sea Conference.

Among the most pressing problems identified for study were:

a. Information Needs

1. For developed states, what types of research are likely to be impeded in foreign waters? Are substitutes available; what approaches should be used in obtaining access?
2. For developing states, what are the scientific and technological needs and capabilities for environmental protection, resource development, etc.
3. What information is necessary for effective management of the international, economic and coastal zones.

*MIT Workshop Report, p. 21.

4. What are the optimal policies for international spread of ocean science and technological information, including communications and institution building?

b. Uses of Information

1. How can ocean research respond to short-term social needs and maintain a reasonable rate of evolution?
2. How can science and technological information be better conveyed to and absorbed by policy makers?
3. What is the appropriate role for marine scientists and engineers in policy research and the policy-making process? Are there semantics problems to resolve? What communications vehicles are there? What are the differences in norms between developed and developing cultures?
4. How can marine R&D be best organized to respond to crisis?
5. Alternative processes for establishing research priorities.

IV. PRIORITIES

Policy-related research, unlike other types of research, carries with it some unique problems, particularly when it is associated with science and technology-related matters. In determining priorities for research, one would normally select those issues which need resolution in the shortest time period; those problems which have come to the attention of central decision-makers; or those problems which have an obvious relationship to an ongoing or potential problem of crisis diplomacy. The consequence of this thinking leads to an emphasis on short-term research needs and places middle and long-term needs in the background. Here lies the dilemma. Activities are moving so rapidly in ocean-related areas that it is essential to keep abreast of the latest information. Yet this leaves little time for long-range thinking, and both current and potential activities could have such far-ranging implications globally as well as nationally, that we are forced to think both short-term and long-term. But how do we do this when the vehicles and institutions for implementing even short-term policy research projects are inadequate both from the funding agency and the receiver end of the system? Compelling NSF to support short-term policy projects to answer user needs could lead to a procedure with "difficulties both in submitting proposals for peer review and in responding to the needs of these user agencies on a time scale that would be useful to them."* While the 1973 study suggested with great reluctance some alternatives to permit short-term research, none was really felt acceptable and the suggestion was that NSF support long-term research with the hope that it might still impact on current issues and affect policy decisions that were concerned with long-term questions.

*MIT Workshop Report, p. 9.

Obviously, an infinite number of policy decisions must be made by numerous agencies dealing with ocean-related matters, and current activities such as the Law of the Sea Conference and the rapid developments taking place in technical innovation place unprecedented urgency on making wise short-term decisions based on the most reliable information available. Therefore, the 1973 recommendations fall short of addressing the problems of ocean policy research. New methods and procedures must be worked out to assure that expert information is provided to policy-makers on a real-time basis. Those who do the research also have a problem in responding to real-time research needs, since many are associated with universities and have a number of other responsibilities which must be performed in addition to their research, such as teaching. Centers with full-time research staffs are being established at a number of universities, a situation which begins to resolve the problems on the university side. Yet more attention needs to be given to this situation to assure the necessary research can be accomplished within a useful time frame.

While the needs for short-term policy research must be fulfilled, there is a continued need for middle and long-term research in marine policy, too. NSF (if the RANN program is phased out, probably the International Decade of Ocean Exploration office) international ocean activities should also concentrate on the identification and analysis of emergent problems and opportunities, and on long-range policy guidance. Current problems and issues will continue and change over time with events and changes in science and technology. We must be able to anticipate the implications of these changes and have alternative policy directions carefully thought out and ready to apply when the appropriate times arrive.

V. APPENDICES

APPENDIX A

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APPENDIX B

BACKGROUND PAPER: MARINE POLICY RESEARCH NEEDS 1975

by Judith Tegger Kildow

I. INTRODUCTION

In 1973, a workshop was held at Massachusetts Institute of Technology under the joint sponsorship of MIT and the National Science Foundation to discuss Priority Research Needs on Technology-Related Transnational and Global Policy Problems.* In February 1975, another group of people met in Washington under the joint sponsorship of the National Science Foundation and the Public Research Institute of the Center for Naval Analyses, this time to appraise the current status of a particular area of research needs identified by the 1973 workshop, ocean policy. With the rapid and significant developments in marine affairs in the two intervening years, the participants in the 1975 meeting were asked to make recommendations for areas of marine policy research which they strongly believe merit funding by the National Science Foundation.

A number of valuable and relevant points were made in the 1973 report which should not be lost to those participating in the 1975 meeting. Let us review them before moving on to provide background information on current marine policy research and identify some of the key areas which are weak or have been neglected.

The members of the 1973 workshop recommended that among the most important policy areas requiring attention in which science and technology play a significant role and in which there was relative absence of funding sources for policy research on international issues was ocean policy.** However, the members of the workshop also recognized that a move into internationally related policy areas required that care should be exercised in the development of the relationship between RANN International and the government agencies with mission responsibilities in international affairs. "The workshop recognized that the quality of the research output and its usefulness to policy-makers would benefit by close contact between the researchers and one or more of the potential users of the research product."*** Nevertheless, it was also noted that close contact between the potential user and the researcher could lead to special problems including loss of academic freedom to investigate diverse points of view, since certain agencies might feel that their perspectives had been ignored or misunderstood; or place RANN International in a precarious position of

*Priority Research Needs on Technology-Related Transnational and Global Policy Problems. Report of Workshop Held on March 7-8, 1973 by MIT and NSF, Center for International Studies, MIT.

**MIT Report, p. 2.

***MIT Report, p. 7.

neglecting or alienating particular agencies. The resultant recommendation to resolve this problem was for RANN to follow its own criteria: "focusing on those policy issues raised by the continued advancement and application of science and technology and on opportunities for using science and technology to ameliorate international problems...and not to appear...to advocate a particular policy position."* In addition to making these suggestions, this same report adequately defined the general scope of research which RANN should support in terms of a definition of "international" and of "United States' Interests."** I have assumed those guidelines for purposes of this paper.

Policy-related research carries with it some unique problems, particularly when related to science and technology-related matters. In determining priorities for research, one would normally select those issues which needed resolution in the shortest time period, needing the greatest attention. The consequence of this way of thinking leads to an emphasis on short-term research needs and places middle and long term needs in the background. Here lies the dilemma. Activities are moving so rapidly in ocean-related areas that it is essential to keep abreast of the latest information. Yet, this leaves little time for long-range thinking, and both current and potential activities could have such far ranging implications globally as well as nationally, that we are forced to think both short-term and long-term. But how do we do this when the vehicles and institutions for implementing the short-term policy research projects are inadequate both from the funding agency and the receiver end of the system. Compelling RANN to support short-term policy projects to answer user needs could lead to a procedure with "difficulties both in submitting proposals for peer review and in responding to the needs of these user agencies on a time scale that would be useful to them." While the 1973 study suggested with great reluctance some alternatives to permit short-term research, none was really felt acceptable and the suggestion was that RANN support long-term research with the hope that they might still impact on current issues and affect policy decisions that were concerned with long-term questions.***

Obviously, an infinite number of policy decisions must be made by numerous agencies dealing with ocean-related matters, and current activities such as the Law of the Sea Conference and the rapid developments taking place in technical innovation place unprecedented urgency on making wise short-term decisions based on the most reliable information available. Therefore, the 1973 recommendations fall short of addressing the problems of ocean policy research. New methods and procedures must be worked out to assure that expert information is provided to policy-makers on a real-time basis. Those who do the research also have a problem in responding to real time research needs, since many are associated

*MIT Report, pp. 8-9.

**MIT Report, pp. 14ff.

***MIT Report, p. 9.

with universities and have a number of other responsibilities which must be performed in addition to their research, such as teaching. Centers for full-time research staffs are being established at a number of universities, a situation which begins to resolve the problem on the university side. Yet, more attention needs to be given to this situation to assure the necessary research can be accomplished within a useful time frame.

While the needs for short-term policy research must be fulfilled, there is a continued need for middle and long-term research in marine policy, too. RANN International ocean activities should also concentrate on the identification and analysis of emergent problems and opportunities, and on long-range policy guidance. Current problems and issues will continue and change over time with events and changes in science and technology. We must be able to anticipate the implications of these changes and have alternative policy directions carefully thought out and ready to apply when the appropriate times arrive.

How adequately current research seems to be meeting these needs is the subject of this paper. In order to arrive at some useful conclusions, I have done the following:

1. Defined the principal ocean activities which are the focus of most ocean policy issues.
2. Provided a policy framework for understanding the significance and relevance of these issues.
3. Provided a brief survey of current marine policy research, including where it is being carried out, from which disciplinary perspective(s), and when possible, by which methods of approach.
4. Listed those areas of marine policy research which (a) policy-makers indicated were weak, and which (b) academicians indicated needed more study.
5. Indicated my own conclusions about research needs and priorities.

II. DEFINITION OF POLICY PROBLEMS

The evolution, expansion and general change in the activities carried out at sea have compelled nations currently involved in these activities and nations anticipating involvement carefully to evaluate their national and international priorities and the role ocean activities should play in their overall policy considerations. (Consider the National Ocean Policy Study currently being carried out by the U.S. Congress.) The recent Law of the Sea negotiations under the sponsorship of the United Nations is only one manifestation of concern for the oceans. Meanwhile, countries, corporations, and individuals continue and accelerate their participation in ocean activities.

The principal ocean activities for which there is the greatest interest are resource exploitation--offshore oil and gas--and deep-sea minerals; transportation, and marine

science research. Energy from the oceans is still only a minor interest for now. The existence of these primary activities generates some significant secondary areas for concern: marine pollution; utilization development, conservation, allocation and distribution problems for resources; traffic congestion problems for ships, regulations for ships and shipping (e.g. rates, standards, insurance etc.) scientific and technical information dissemination and use. Underlying these problem areas is a third layer of vehicles which can be used to impact on the primary activities and secondary concerns if they are understood and appropriately applied. These are political, legal and economic systems. These are the systems through which governments and businesses--public and private decision-makers--must provide guidance and solutions to the problems created by man's activities at sea. The kinds of issues addressed by this category relate to two main themes: how nations with diverse interests can best come to terms with each other; how numerous vested interests which often transcend national interests can exist together with minimal conflict and effective achievement of goals and priorities. Both areas require understanding and consideration of impacts--economic, political, sociological--of activities on affected parties for negotiation for compromises. Adequate information systems, both verbal and written are essential. In addition, effective political structures for communicating, negotiating, regulating and enforcing are necessary. Implicit and essential is the information itself used in the decision-making processes--basic scientific and technical information, economic information, political, social and legal information, and the capacity to incorporate the results into a viable system.

The preceding paragraphs, while describing the main concerns and activities in the oceans, don't adequately address a significant set of ocean-related activities and problems, although the overlap is apparent. These are coastal zone related activities. While many of the activities and problems are the same, there are some striking differences which must also be noted. First, the large numbers and diverse types of activities in the coastal zone exacerbate the transportation, pollution and resource problems discussed before. The added dimension of population pressures and industry density, of recreational activities, residential developments and commercial developments in the coastal areas make these problems uniquely difficult to resolve. While other marine problems primarily represent international issues which need to be handled first at the federal level, the coastal zone problems are national problems with international impacts and will be exacerbated by the probable extension of coastal jurisdiction over ocean resources. As such, coastal zone problems need to be approached from an international perspective.

III. IMPORTANCE OF POLICY PROBLEMS

The uses of the oceans and the problems generated by these uses illuminate a number of sources of the problems. We can assume that a better understanding of these sources

could potentially lead to resolutions to some of them and at least alleviation of some of the international tensions created by others. Among the most obvious and most easily recognized are:

1. New roles for the demands on international institutions.*

a. Better understanding of international institutional behavior is needed so that the structure of both new and expanded international machinery can be appropriately tailored to the functions they must perform. From a global perspective, it is necessary to learn what geographical and functional constraints dictate global or less than global approaches to resolving problems, for example. Studies of voting behavior and negotiating strategies also aid in the restructuring of institutions. Perhaps most significant is the necessity to identify and understand the perspectives and interests of other key nations, so that equitable compromises can be struck under appropriate arrangements. The growing numbers of participants in international negotiations has placed unprecedented pressures on old procedures, and require new approaches.

b. Improved understanding of the diverse interests of the U.S. in the oceans and the consequent determination of what role the U.S. should play in shaping new or expanded institutions to accommodate these interests. These fragmented and rapidly proliferating number of interest groups, formal and informal, which influence the U.S. policy processes make policy decisions increasingly difficult. There must be strong criteria and guidelines for weighting these numerous interests and their impact on national priorities and international priorities, for U.S. negotiators to provide an effective and accountable representative function for their nation. Thus, research on the national policy processes, including criteria for measuring their effectiveness, selecting priorities, and determining the degree of success and failure in attaining policy goals would make an essential contribution to this problem area.

2. The changing nature of national sovereignty. Many of the ocean activities and the innovations in science and technology which relate to the oceans raise questions of intrusion into the national societies of all countries. The use of resource satellites or even the sophisticated nature of the equipment on modern research vessels appears to threaten national sovereignty in new ways. The "freedom of oceanic research issue" is but one manifestation of this problem area.

The increasing demands for international accountability and responsibility are evidenced by national outcries over oil pollution and declarations of extended jurisdictions for pollution control as well as restraints on passage through straits by oil tankers

*The six categories on the following pages are taken from the 1973 Report, but the information content within each category has been prepared especially for this paper.

and other ships carrying potentially harmful cargo. These issues require clearer understanding as a basis for gradual evolution of national behaviors. The result of these conditions has been a vocal but cautious quest for greater international cooperation in marine science and technology affairs among and between both industrialized and less industrialized nations.

3. International Conflict Resolution. Many of the current events and the developments of new technologies portend potential conflict and national security concerns. Boundary disputes over offshore resource discoveries are the most predictable at this time. However, if and when there is agreement at a Law of the Sea Conference over territorial seas or resource zones, these will become acute problems too.

One cannot overlook the innovations of underwater detection devices or of outer space satellite oversight as threats to national security and potential points for international conflict. The potential closing of straits or the non-agreement of jurisdiction over strategic straits could lead to some unpleasant international tensions. The institutions and methods to deal with these types of problems must be further investigated. However, it is the explicit mission of this workshop and this background paper to address itself to non-military related matters, so these issues will only be addressed peripherally as they relate to conflict avoidance and resolution through better understanding of the use of international vehicles and the impact of other issues on such circumstances.

4. Implications of science and technology for development. Among the most pressing and yet least understood issues which must be addressed with some urgency are those relating to the impact of the ocean activities on the developing nations of the world. These questions are by no means only ocean-related, because they include problems of equitable distribution of wealth and resources, participation and representation of these nations in international decisions affecting their current and future welfare, and the utilization of new technology to benefit these countries. A particularly sensitive question, but one which must be investigated, is how domestic American decisions impact on developing countries and the possibility of eventual international regulation and management of particular resources. International acceptability must be a criterion for consideration in technical choices that are now made essentially on the basis of efficiency or optimum performance criteria, the foundations for the private enterprise system in the United States. Deep ocean mining is probably the most obvious pending issue in this area.

5. The Politics of Scientific and Technical Information. Integrally related to all of the previous issues are the growing difficulties in handling information which may be militarily or commercially sensitive. In addition, the existence of verifiable and believable data may be centrally involved in the resolution of conflicts that could arise out of the application of new technologies. For example, there is some question of the necessity

for exploratory activities to be carried out by private mineral companies rather than public bodies. Mineral companies argue that the expense of developing the technologies and the degree of precision necessary for the decision to bid on a lease must be in the hands of the private company for the company to have any incentive to participate in the activities. Reliable information about the technology requirements is essential for decision-makers to negotiate on this issue. In addition, the generation and use of information needed for policy decisions is often difficult to understand when contributed by the generator of the information, usually a scientist or engineer, and is even more difficult to use when knowledge is incomplete or is dominated by intrinsic uncertainties.

Finally, on this subject, there is a grave difficulty in cataloguing and making known what information exists in the numerous areas and then distributing it to those who need the information, and most significantly assuring that those who need the information know how to optimize the use of it. As with resources, we find the same problem in the utilization, distribution and management of information.

6. New Methods of Approach to Marine Policy Research. A special area directed specifically at ocean-related policy problems is that of performing good research. The types of policy problems uncovered in the past few years pose new kinds of problems and require new ways of thinking. Many of the problems have a much broader scope than just ocean problems. Some of them are issues which relate to resource management problems, transportation of goods, environmental pollution and conservation controls, and many others too numerous to mention. The fact that all of these require transdisciplinary or multidisciplinary approaches is indisputable. Since such approaches are few and most of those used in embryonic stages, much work needs to be encouraged here.

IV. SURVEY OF MARINE POLICY RESEARCH

With some sense of the scope of research topics with which we are working, and some idea of the scope of marine policy problems which government policy people must face, I shall attempt in this section to provide a useful survey of marine policy research which has recently been completed or which is currently underway. Following this survey, I shall indicate the areas of research needs identified first by policy makers who require information for their work, and secondly by academicians who do marine policy research. This survey in no way pretends to be comprehensive, although it should indicate those topics of current interest to academicians and policy-oriented public servants. Since almost all of these studies are funded either publicly or privately, one must assume that the work is being done as a response to some need. Sometimes, we shall find, that need is not altogether apparent.

The information in the following pages is a compilation of data gathered from a survey sent to 45 members of the academic community and 20 members of the federal government who have marine-related positions, with need for research information of all kinds. Additional data was gathered from three source books:

1. Marine Research 1973, Federal Council on Science and Technology.
2. Contemporary Research in Marine Affairs, G. Mangone, University of Delaware, 1974.
3. A Preliminary Report on International Fisheries Management Research, National Academy of Sciences-NRC, 1971.

Finally, the author carried out ten interviews with selected academicians and policy-makers for verification purposes. The objective of this descriptive survey is to identify areas of marine policy research which have been neglected but which either policy makers or academicians feel are necessary for effective decision-making regarding the oceans in the future. Hence, through identifying current areas of work in the area, one can begin to see where gaps may lie or where better quality research needs to be done.

Summaries of Current Marine Policy Research

1. Mineral Resources Policy. Four general areas of minerals policy research were identified. They were (a) actual or potential economic productivity of oil, natural gas, and minerals from manganese nodules; (b) international seabed authority to manage nodules; (c) environmental effects on resource development at sea (oil and gas and nodules) and national and international agreements pertaining thereto; (d) economics of ocean dumping.

More specifically, the economic and environmental consequences of offshore drilling for oil and gas have been the foci for studies at MIT, University of Delaware, University of Southern California, and the University of Oklahoma. Computer models and survey techniques were the principal modes of research. Included in ocean minerals research at the University of California at Berkeley were analyses of exploitation under alternative tenure proposals; the possible need for and methods of subsidization for producing companies, the effects of alternative taxation proposals on possibly exploited minerals, regulatory systems for exploitation of minerals. Here theoretical and comparative systems were the approaches used. At the University of California at Santa Barbara, research is progressing on economics of ocean mineral resource development and related public policy issues. They are investigating cost output analysis for several minerals, externalities involved in the exploitation activities, and alternative public policies.

More economic studies for minerals, but hard minerals, is being conducted at Columbia University School of Mines and Business School. Market studies, necessary legislation to meet technical needs and economic incentives are the focus of these activities. Also, the possible alternative international legal regimes which might regulate such

activities are being studied. The Marine Policy Center at the Woods Hole Oceanographic Institution is currently doing a study of the potentials for accommodation between the fishing industry and the petroleum industry for offshore oil and gas development. Researchers at WHOI are also working on institutional arrangements for resource claims and alternative regimes for the international seabed authority. WHOI is mixing economic and legal studies. Johns Hopkins School of Advanced International Studies has some work on possible international jurisdictional disputes over offshore oil and gas. Finally, the legal aspects of ocean resources exploitation and conservation is a topic of research at Louisiana State University Law School, particularly as they relate to the Law of the Sea Conference.

2. Fisheries Policies. Five general areas of fishery research were identified. (It should be noted here that fisheries research represented the largest share of marine policy research both in numbers of projects and financial outlay.) (a) Marketing and economics of fisheries; (b) Economic and legal aspects of aquaculture; (c) Behavior and socio-economic status of fishermen and the fishing industry; (d) Policy alternatives and federal and state fishery laws; fishing cooperatives; and management to provide limited entry; and (e) Global and regional fishery control.

General fishery studies were economically or business focused. A few studies dealt with political and legal problems of enforcement of agreements or of negotiating agreements. A more detailed breakdown of fisheries research follows:

The economics and commercial structure of the fishing industry were subjects for study at Texas A and M, the University of Maine, the University of Delaware, University of Rhode Island, University of Massachusetts, University of Maryland and Clemson University as well as the Department of Commerce Economic Research Laboratory. Some of the specific topics investigated were the establishment of product and processing requirements; evaluation of economic feasibility of alternative management programs; attempts to define optimum resource mix in production and processing by marginal analysis.

The New England fishing industry is being intensively studied by several Atlantic coast universities. They are trying to identify the major problems of the industry and evaluate the impact of adverse factors such as pressure from foreign and other domestic fleets, costs, etc. on earnings to vessel operators and to the fishermen.

Methodological approaches used in these economic studies of the fishing industry investigation of the production flow network, data collection, case studies, questionnaires, regression analysis, transportation models, budgetary analysis, production function models. Probably the most extensive work on the economics of international fisheries management is being done at the University of Washington.

Additional fisheries studies that are not primarily economically based are being carried out at numerous institutions. The University of Miami is doing work on the theory of fisheries management, as well as economic analysis of fisheries proposals to the Law of the Sea Conference, and some recommendations for national fisheries management legislation in the United States. Persons at the University of Wisconsin Law School are studying extension and enforcement of fisheries resource zones beyond territorial limits and the resultant international fisheries disputes. University of Rhode Island researchers are looking at the constitutional impediments to limited entry concepts. They are also studying the sociology of fishing cultures. WHOI has just produced an anthropological study of a New England fishing culture. Harvard Law School is doing work on fisheries issues in the Yellow Sea and the East China Sea and the potentials for dispute there. Resources for the Future has carried out work on alternative policies for actual situations of fishery regional management, mixing economics and policy. The University of Hawaii and the National Marine Fisheries Service have done economic and management studies of tuna. A survey of catch statistics and migration patterns for certain species for economic and legal studies is being done at the University of North Carolina's Institute for Marine Science. While other fisheries work is being done in several additional places, these are the key pockets of fisheries research.

3. Transportation and Navigation Policies. Four general areas of study were identified: (a) Legal, economic and environmental problems of deep-water terminals; (b) Containerization and port planning; (c) Financing and management of shipping operations; and (d) Hazards of maritime transit.

Deep-water terminal research is being carried out primarily at Texas A and M and the University of Houston. Containerization, port planning and general financing and management of shipping operations are areas of research at MIT, the University of Washington, the University of Wisconsin and Rutgers. The University of Delaware has just announced they will be placing heavy emphasis on this area in the near future. The Department of Commerce Maritime Administration is doing a study of domestic shipping market analysis and a long-run prediction of U.S. seaborne trade. The U.S. Department of Commerce National Marine Research Center is doing a study of shipping productivity. Louisiana State University Law School has done some work in hazards of maritime transit from the legal perspective. Either the sources used for this background paper were not valid measures or research in this area has not been extensive or intensive, and there is much to be done.

Most of the economic studies use computer models and information projections.

4. Marine Pollution Policies. Most marine pollution research focuses on the following problems: (a) Domestic and international laws relating to marine pollution; (b) Oil Pollution; (c) Problems of controlling land-based and air born pollutants; and (d) Use of scientific information by decision-makers.

More specifically, research in marine pollution policy is being carried out from the legal perspective at WHOI, MIT, the Fletcher School at Tufts University, the University of Rhode Island, University of Miami, University of Oregon and the University of Wisconsin. International policies and international organization activities regarding marine pollution are being studied at the Scripps Institution of Oceanography. Case studies in environmental decision-making are being studied at the University of Michigan; and the economics of oil pollution and the general problem of environment vs. economics is being studied at MIT and at Johns Hopkins SAIS. The author was unable to locate work which integrated the politics and economics of international marine environmental issues.

5. Coastal Zone Management Policy. Coastal zone management policy issues cut across some of the areas previously covered in this section and so this part may include some of the voids left in other research areas. Although some of the research detailed here applies more to national than to international policies, it falls under the definition used for the purposes of this report.

Most universities along the coasts have some coastal zone research, but it applies to very local conditions. However, there are a number of places that are doing broad-based coastal zone studies which have national and international significance. The economics and policies of marine and coastal resources is the basis for a large program at the University of California at Berkeley. Law, politics and economics provide the foci for these studies and they are both short-term and long-term studies. The University of Delaware School of Business has done an economic analysis of coastal related industries. Economic models for resource utilization and development are being formulated at the University of California at San Diego. Specifically, international coastal zone studies and comparative analyses of coastal resource policies and management in a number of countries is the basis for work at the University of Southern California, University of Michigan, University of California at Berkeley, University of Rhode Island, University of Washington, MIT, and the University of Delaware.

6. Marine Science Policy. The freedom of scientific research issue has been given documentation and some analysis for the past few years by the Ocean Affairs Board of the National Academy of Sciences. The Center for Marine Affairs at the Scripps Institution of Oceanography and the Marine Policy Program at WHOI have also done several studies to illuminate the problem so that effective policy recommendations might be made. These studies focused mostly on the Law of the Sea negotiations, although the work at WHOI may be going beyond that to actually making recommendations for and implementing programs to begin to alleviate the problems.

The role of marine science and technology and the developing world. Closely related to the scientific research issue and problems of international coastal zone management is the policy issue of sharing marine information and expertise with lesser developed nations. MIT, University of Washington, and the Center for Marine Affairs at Scripps are carrying out research in this area. Since this is such a new area, most of this work is in embryonic stages.

7. International Organizations, Institutions, and Law. Once again cutting across several areas of research, I have singled out this category of research because it was more institution-based than marine activity oriented.

Studies of transnational relations using case studies of ocean activities are being carried out at Harvard. A project at the University of Washington has analyzed the structure, interrelationships and responses of the international decision-making system for the oceans. Both of these projects use case studies, survey research and systems analysis. The University of Miami Law School has done research examining the effects of unilateral actions of other nations on the decision-making process in the United States such as expropriation of industries. Dispute settlement and enforcement problems are the subject of study for a project at the Harvard Law School. Negotiating strategies in the U.N. Law of the Sea Conference, using thematic content analysis and computer models are the basis for a large project at the Center for Naval Analyses. The information of U.S. policies for the U.N. Law of the Sea Conference is a continuing project at Johns Hopkins SAIS.

8. Future Technologies and their Impacts on Society. The American Society for International Law has a large project relating to international, legal and institutional problems generated by new developments in science and technology, and by changes induced by technological applications. The University of Hawaii is doing work on artificial islands and their impacts on societies. The Brookings Institution has also had a major study of future impacts of many types of technologies, not just ocean-related.

V. RESEARCH NEEDS

Having provided a sketch of current marine policy research it is interesting to note some specific areas of research which public servants in marine-related areas and academicians who carry out research believe need further work. Each will be presented separately. The juxtaposition of the two responses provides an interesting perspective.

From the point of view of the policy person who is the information user, there were two types of research problems they identified: problems in the policy process itself, and information gaps in particular marine-related areas.

Some of the problems enumerated under the first area are:

1. The need for a sustained effort at supplying real-time information.
2. Better mechanisms to promote greater public understanding of policies.
3. Improved government policy mechanisms and operations for complex issues.
4. Communication gaps due to complexity of issues and numbers of participants in the policy process.
5. The need to strengthen U.S. government organization for marine policy decision-making.

Research gaps in specific areas identified by policy people were:

1. Transportation and Navigation
 - a. Better information regarding potential dangers and possible solutions to transporting certain substances by ship such as LNG and bulk chemicals.
 - b. Projections of supply and demand for ocean shipping and better international cost comparisons for international shipping.
2. Resources
 - a. Information regarding joint ventures in oil and mineral exploitation.
 - b. How to set priorities for resource use and management.
3. Political and International Organizations
 - a. More ideas on dispute settlement and enforcement measures.
 - b. Better mechanisms for international decision-making.
 - c. How to facilitate marine technology transfer and more effective international marine technology cooperation.
 - d. Lack of systematic data on national policies of foreign nations based on parliamentary discussions and local periodicals.
 - e. Better information on potentials for trade-offs of one use for another by a nation.
 - f. Interest perceptions: how policy makers in various parts of the world envision national interest in the ocean.
 - g. Effects of general relations between or among individual states as they may impact on long and short-term decision-making for fish, minerals, etc.

Turning to the response from the academic community, there were also two types of responses: the identification of structural problems between sectors or disciplines, and actual substantive gaps in understanding.

The first set reflected problems of doing marine policy research:

1. Failure of researchers and policy makers to realize the interdependence of different disciplines in setting marine policy or approaching marine problems.
2. Failure to consider the larger setting that influences marine policy (i.e., most studies are too narrow to be helpful).
3. Gaps between theoretical development of management systems and application of a program to interest groups.
4. Failure in the coordination of scientific research, policy formation and decision-making through inappropriate use of constituencies.

The second set enumerated marine policy research needs and provided a meaningful basis for consideration. With few exceptions they cut across the activity categories for research and so appear in miscellaneous fashion.

1. Problem perception by different interest and national groups.
2. Better information on the production and use data of pollutants chemicals such as PCBs.
3. Protocols or strategies for identifying potential pollutants.
4. Inability to measure optimal U.S. port capacity.
5. Political factors involved in resource exploitation.
6. Economic information scarce to provide foundation for political and sociological implications for resource utilization.
7. Linkages between science, decision-making and management not understood.
8. Lack of understanding of long-term coastal development impacts.
9. Lack of basic resource data.
10. Policy evolution of regional and international programs is not well documented.
11. More technology assessment of coastal resource development alternatives.
12. Law enforcement systems pertaining to the oceans not well understood.
13. Boundary determination criteria poor.
14. Need for more intensive analysis with more sophisticated techniques in the social sciences.

15. How to manage economic resource zones, internationally and nationally.
16. Establishment of values; identification of power centers; reconciliation of diverse criteria; impact of perspectives on outcome of decisions.
17. Accommodation of technological change into social and economic planning.
18. Practice and dynamics of international regulatory behavior.
19. Alternatives to global management patterns.
20. Resource management schemes of maximizing resources with appropriate political framework to implement them.
21. No basic data on marine needs of developing states.
22. Studies of externalities in all marine developments and the effects on environmental and human well-being.
23. Impact of various ocean regimes on world stability.
24. Options for national and international actions following a failure of the Law of the Sea Conference.
25. National views of fishing policies regarding allocation and efficiency in zones.

VI. SOME OBSERVATIONS ON RESEARCH NEEDS

Returning to the question this background paper addresses--what international marine policy issues of importance to the United States merit priority in commitment of funds for their investigation by RANN International. I shall present my own opinions based on the surveys, other research which went into this paper, and my own experience. I would especially like to discuss two matters: short-run law of the sea and ocean policy needs, and a basic problem in the methods employed in ocean policy research.

Those aspects of the law of the sea where short-run research seems necessary at this time are the following:

- I. Assuming a successful result from the Third U.N. Law of the Sea Conference, the arrangements would not be implemented for some time due to time lags. Therefore, what kinds of interim arrangements would be feasible for the U.S. to initiate or accept from others which would not interfere with the finalization of agreed to arrangements or which would not be detrimental internationally if no agreement were reached? While there is research continuing in this area both in and out of government, the areas of controversy are so strong as to suggest that none of the current recommended solutions for interim arrangements are suitable.

2. During the intervening period without agreement or until there is agreement on the numerous issues, what tactics or strategies should be employed for the few important nations which refuse to accept parts of the agreement or take unilateral actions?

3. Specifically related to some alternative outcomes of the Conference, what are the implications for various ocean uses? For example, how does the U.S. assure access to ocean areas?

4. What are the potential effects of some of the outcomes on domestic institutions? For example, what domestic programs and agencies will be affected if there is a 200 mile resource zone?

Appraising more specific ocean policy areas where there appears to be a dearth of information for decision-makers, I would place heavy emphasis on the need for policy research relating to ocean transportation systems, and the needs and locations for transport of goods in the future. I found very little social science work on these problems and their importance should not be underestimated in terms of influencing the stability of the political and economic systems.

Secondly, I would recommend that further work be done in the area of ocean resources utilization and management. This is an area of research barely tapped and requiring immediate decisions which will have far-ranging implications in the future. How one sets priorities and what criteria to use are still ill-understood by those who must make the decisions.

Finally, I would recommend that information be compiled about the needs and capabilities of other nations in marine-related areas so that the foundations for improved international cooperation can be laid. Efforts must be made to uncover the untapped skills and information which must exist throughout the world, and more effective means must be found to apply them.

Before concluding, I would like to say something about the relevance and quality of the current research efforts and where improvements might be made. While verbal recognition is given to the need for transdisciplinary treatment of marine policy problems, there are few examples of real attempts yielding significant results. Political scientists, lawyers, and sociologists working in the area rarely give adequate treatment to economic considerations which are most often integral to their work. However, economists in this field fall victim to the same failures by ignoring the sociological and political implications of their work, claiming to set up the "solid" framework for the political scientist or sociologist. Neither of these approaches is adequate and strong encouragement needs to be given to real integration of these perspectives. This need is equally important for the study of all the primary marine activities for which policy decisions must be made. The ability to perform the kinds of research required to attack such complex and multifaceted problems appears to be extremely limited at this time due to cultural, institutional

and information constraints. Therefore, it seems essential for a measured, patient and enthusiastic endorsement of experiments in development of new techniques for approaching these numerous policy research areas. For instance, while economic theories and approaches are essential to most of these research areas, most economic studies sorely lack any behavioral methodologies and handling of value system problems, rather leaving those "gray" areas to the political scientists and sociologists--an entirely inadequate approach to any study of this kind. On the other hand, political scientists and lawyers suffer from much the same problems. They revert to old methods of analysis, such as case studies and comparative studies, but the results are too often superficial and not very useful. Claiming that quantitative methods are not appropriate, most social scientists in the marine policy field don't even use systems methods, probably the most appropriate for the types of research currently necessary for policy-makers. Each type of methodology certainly has a place, but the utter reluctance of one discipline to try to use the tools of other disciplines, working together with people in those other disciplines is detrimental to current marine policy research. The use of sociological, psychological and anthropological methods of research is sorely lacking from current policy research. Part of the reason may lie in the fact that those dominating the field don't know where these persons fit into the picture. Another part is that present university structures, tied to the tenure system and traditional approaches, often discourage persons in those disciplines from entering this relatively new area of research. Means must be found to encourage the integration of these many perspectives in a real, not cosmetic arrangement, where engineers and economists learn the benefits of legal and political science analysis and learn to use them, and where political scientists and lawyers dare to enter the quantitative world of the scientist, engineer and economist, using their tools appropriately.

Currently, theory and method seem very limited in the field of marine policy research. While large numbers of studies are being carried out and generate large amounts of data, the analysis of the information and data is largely superficial and needs much more sophisticated in-depth analysis with a focus and sense of direction.

While there is much to be said for generating information for the sake of having the information, we must also remember that information must find its way into the hands of someone who needs it in a form in which it can be used. Thus, much raw data may be stacked in libraries, making little contribution to anybody, unless it is translated into information useful for some purposes and in a language easily understood by the persons needing the information. Therefore, it might be useful to continue current research into the use of information by policy-makers and the science advisory function in government--"science" meaning social science as well as natural and physical science.

APPENDIX C

LIST OF WORKSHOP PAPERS

Working Group One - Science, Technology, and Environment

Gerald L. Wick - Ocean Science Policy Research Needs

Edward Wenk, Jr. - Policy Planning in Marine Technology

Working Group Two - Ocean Resources

Herbert D. Drechsler - Ocean Resource Policy Research Needs

John W. Devanney III - Economics and Ocean Policy Research

NAS Report - A Preliminary Report on International Fisheries Management Research
(distributed with permission)

Working Group Three - Ocean Law and Institutions

David Kay - Transnational Ocean Institutions: Research Needs

Ann L. Hollick - National Ocean Institutions: Research Needs

John L. Hargrove - Ocean Law: Research Needs

Davis B. Bobrow - International Policies and High-Level Decision-Making: Context
for Ocean Policy

Lewis M. Alexander - Ocean Study Institutions

APPENDIX D

A REPORT ON THE EFFORTS OF THE WORKING GROUPS

On the first day of the Workshop on Ocean Policy Research (February 10, 1975), the participants, at the request of the Chairman, broke up into three working groups. They were: Working Group I, Ocean Science and Technology; Working Group II, Ocean Resources; and Working Group III, Ocean Law and Institutions. The purpose of creating the working groups was to allow them each to submit recommendations on ocean research needs relating to national interests, resolving problems relating to doing policy research, and recommending needed improvements in study methodology.

Each of the working groups was provided with a rapporteur; those participants submitting papers relevant to a working group's mandate were asked to lead the discussions; and very general instructions were given the participants about how to proceed. It was understood that the task of a working group was potentially schizophrenic, that is, on the one hand, they were to develop a coherent set of research recommendations, a very pragmatic task requiring that they consider to all proposals seriatim; on the other hand, there was a temptation to pursue one or more of the interesting intellectual problems discussed in some detail attempting to revolve some of the underlying problems. The three working groups pursued their tasks in quite different ways. The different approaches they took are useful examples of the sociology of applied social science.

Working Group I was composed primarily of people with scientific and technical training. After an initial survey of the possible subjects they could consider, the members of the group chose to spend most of their time discussing the problem of giving scientific advice to the U.S. Government instead of developing a "wish list" of research projects relating to scientific and technical problems. The discussions were cooperative, interactive, and within the time limits available, thorough. Naturally there was not sufficient time to complete the discussions and resolve to the satisfaction of the participants the major problems of giving and receiving scientific advice in the context of the U.S. political system.

Working Group II, dealing with problems of ocean resources, was composed primarily of participants with either resources development or economics training and experience. It took as its task the assembling of a list of projects worthy of future research support. The participants assumed that the listed projects would be competitive with each other for support. As a result many of the participants stoutly defended the emphases, and the projects that went with them, that they thought worthy and often attacked those projects they believed might compete for financial resources with those they preferred. The main-
tained this stance through most of the Working Group sessions so there was little cooperative work done during the sessions and no compromises were made.

Working Group III dealt broadly with problems of the legal and institutional arrangements for ocean use. It was composed primarily of academic social scientists and government officials whose academic training was law. The discussion in the Working Group ranged widely over the substantive area of international law, organizations, and politics, the problems of doing policy research and using policy research, the nature of appropriate research methodologies, and the international and national contexts of ocean policy. The classic clash between academic social scientists and government lawyers occurred with the government officials complaining that the academics translated every subject into a theoretical problem of little use to practical decision-makers, and the academics arguing that the government officials wanted to convert academic researchers equipped to do middle- and long-range analysis into staff analysts merely gathering the latest facts. Nevertheless, partly at the behest of the Chairman, a small working party met, interacted and compromised, and produced a report giving a broad menu of recommended future studies.

REPORT OF WORKING GROUP I OCEAN SCIENCE AND TECHNOLOGY

The members of the working group addressed five topics that dealt with the problems in the research process rather than a specific "wish list" of needed research. The basic problem in doing research for the U.S. Government is in establishing a partnership between the research entity and the ultimate users. The five topics treated this problem at different stages in the research process.

1. How should ocean policy research be formulated in order to improve utilization of the research results? The current impediments for effective utilization are:
 - a. Poor presentations and inadequate understanding by receiver
 - b. Bureaucratic barriers (modulation and distortion)
 - c. Research addresses the wrong question or is too narrow in focus/wrong questions were asked
 - d. Timeliness of the research
 - e. Limited funding and human resources
 - f. Departmental jealousy
 - g. Unresolved contradictions in technical data or policy
 - h. Overload in channel capacity
 - i. Unwillingness to interpret because research is incomplete
 - j. No channels of communication
 - k. Deferred return on research investment
 - l. Advocacy versus objectivity

Conclusion: There is a clear need for interaction between the research entity and the client from the very beginning--at the problem identification stage. The client must take an active role at this stage and possibly introduce a third party, an information translator, to help identify the problem. After the research has been conducted, once again there must be a close interaction between the client and the research entity at the interpretation of results stage. An information translator would be useful at this stage as well.

There needs to be an intimate understanding of the context in which the client is defined as the knowledge consumer--the Congress, the White House, a city government--and not the sponsor.

2. How should the results be presented to increase the flow of information? Although closely tied to the first question, there must be focused injection of research results at the right place. Proper incentives must be established so that the research results flow. In addition, there is a question of role of the sponsor.

3. How should ocean policy research be carried out? A systemic, multidisciplinary approach should be the basic mode of ocean policy research. It should be future-oriented

and should be capable of assessing second-order impacts. If the research entity does not look at all of the components and how different parties or resources affect the final product, the final product may not be complete and may not resolve all the underlying problems.

4. What should be the role of ocean science institutions in ocean-oriented policy research? The role of the institutes is to provide policy facts in their field of expertise and this presupposes an interaction between the knowledge producers and the knowledge consumers. Such institutions have an independent, objective voice that operates beyond the leash. But there needs to be an interaction between social and hard scientists, i.e., multidisciplinary research. Although currently disciplinary sponsors tend to give studies to disciplinary institutes, there should be a movement toward giving studies to universities and multidisciplinary institutes that could undertake a systemic approach.

5. Agenda of research questions. The following general research questions were proposed:

- a. Should scientists take on an advocacy role?
- b. How do you balance short-term research with long-range approach?
- c. There is a need for a post-factor assessment of environmental impact statements...what makes a good statement?
- d. There is a need to develop technology globally to determine where a 200-mile limit is. Is it desirable to have an international coast guard plus international strike-force to clear up catastrophes?
- e. Who should block out the general framework of economic mineral deposits-- industry on a random basis or government on a planned basis?
- f. Should government set up its own competing insurance firm to speed up safety improvements for ships?

-- K.W. Goudreau
Rapporteur

REPORT OF WORKING GROUP II OCEAN RESOURCES

After some uncertainty as to the best approach to use in its deliberations, Working Group II opted for the "wish-list" approach. Each member presented, in turn, his idea of important resource research needs. Well over 20 specific areas were proposed as targets for research. These boiled down to six major areas. Within each major area, examples of the pertinent research topics will be given. The group did not establish priorities among the major areas, nor did it discuss research criteria, leaving both to the working group of the whole.

1. Living resources within the 200-mile economic zone
 - a. The problems of management and enforcement, including entry-limiting schemes; the impact of policy alternatives on the fishing industry and national income, and the transactions costs involved.
 - b. The question of aquaculture and its potential as an alternative source of foodstuffs.
 - c. Basic biological research into living resources to establish yields, food chains, and effects of other uses on living resources.
2. Outer Continental Shelf Resource Allocation and Management
 - a. The effects of various leasing and bidding schemes on the efficiency of OCS resource allocation. Are the respective parties concerned with getting a fair return from the current structure? If not, what alternatives might there be? What incentive techniques (e.g., tax and tariff policies) might be employed to promote exploration and exploitation?
 - b. The question of federalism and revenue sharing--what is the "proper" role of the states; what should their "cut" be?
3. Land-Sea Resource Interplay
 - a. The implications for land-based producers of the production of seabed minerals--questions of substitution as well as competition.
 - b. The impact of offshore production on coastal areas, exclusive of environmental effects (see below), for example, problems of refinery and port-sitting.
4. Changing Patterns of Resource Ownership
(This area addresses the entire spectrum of market versus management.)

- a. The implications of increasing public ownership of natural resources, especially the implications for resource allocation; can we learn anything from current knowledge of foreign systems?
 - b. What is the appropriate role of government regarding ocean resource management and allocation?
 - c. What are the short- and long-term effects on the private sector?
5. Resource Allocation Beyond National Jurisdiction
- (This area is, to some extent, LOS-failure related.)
- Manganese nodules: where are they, how should they be allocated, what would be the costs incurred in going after them unilaterally if LOS does not allocate them at all, or does not allocate them to the satisfaction of the U.S.?
6. Environment
- a. Near-shore - the impact of offshore drilling on living resources and on the adjacent coastal area; the impact of dredging on the structure of the shelf itself.
 - b. Deep ocean (especially surface and water column)--how much pollution is there; what is it doing to the oceans; if it is serious, what is the time frame for action?

--William Durch
Rapporteur

REPORT OF WORKING GROUP III
OCEAN LAW AND INSTITUTIONS

After a general discussion of the five assigned papers, the authors of the five papers met to draw up a preliminary set of recommendations with regard to ocean law and institutions research needs.

1. National Institutions and Processes, Public and Private (Comparative studies and analysis)
 - a. Adequacy of and alternatives to existing national institutions under post-law of the sea (LOS) III regime, in U.S. and other countries
 - b. Generation and utilization of accurate information (national or international mechanisms)
 - c. Storage, retrieval and dissemination system (on international basis?)
 - d. Federal-state relations under post-LOS III regime (see 3-d below)
 - e. Impact of changing international economic and political environment on national institutions
 - f. Coordination of the organizing of private research
2. Transnational Institutions
 - a. Adequacy and capability for growth (both general and regional)
 - b. Capacities of institutions like IMCO to regulate vessel-source pollution (see 3 below)
 - c. Seabed mining regime
 1. Comparative analyses of possible deep ocean mining regimes
 2. Operation of a seabed mining regime (licensing and contractual arrangements, regulation of operations, etc.)
3. Law
 - a. General legal regime of ocean
 1. Consequences of non-agreement (including unilateral U.S. policy which might serve as a model for other countries)
 2. Baselines and other problems of delimitation of zones
 3. International responsibility for environmental injury

- b. Special legal regimes, including (i) Arctic and Antarctic, (ii) pipelines and subsea storage structures, (iii) non-vessel stationary or mobile structures, (iv) harvesting of marine mammals, (v) impact of revolution in navigation on regime of straits, and (vi) overflight.
 - c. Exercise of coastal state powers in economic zone
 - 1. Arrangements with outside entities for exploitations or scientific research
 - 2. Environmental regulation
 - d. U.S. national law (state and federal) on ocean resource exploitation or environmental protection in light of LOS III
 - e. Protection of marine environment
 - 1. International pollution regulation, including (a) probable responses of coastal states and shippers, respectively, to national or international discharge or construction standards, and (b) deep seabed pollution.
 - 2. The desirability of a global treaty on marine environment
 - 3. Control of land-based sources through international devices
 - 4. Specialized questions, including
 - (i) Port-state control over vessel pollution (see c. above)
 - (ii) The "double standard" problem post-LOS III
 - (iii) Control of vessel accidents and casualties
 - (iv) The "conflict of interest" problem in environmental regulation
 - (v) Enforcement and monitoring by international authorities
 - (vi) Participation by private parties in international fora
4. Research Suggestions on Subjects Other Than Law and Institutions
- a. Does oil pollution matter?
 - b. What is marginal effect of eliminating vessel-source pollution only?
 - c. Why do we need unimpeded transit for straits?
 - d. What research are coastal states likely to impede under a consent regime?
 - e. Impact of deep seabed mining
 - f. Effect on U.S. if we had no access to nodules
 - g. Predictions regarding technology advances in tracking pollutants
 - h. How do you set a maximum sustainable yield (MSY)? (Can it be done?)
 - i. Effect of changing economic and political environment--the "new economic order"--on the development of ocean law and institutions.

--Karen Young
Rapporteur

