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BY THE COMPTROLLER GENERAL

Report To The Congress

OF THE UNITED STATES

Impediments To U.S. Involvement In Deep Ocean Mining Can Be Overcome

The abundant resources on the deep seabed could help relieve the Nation's almost total reliance on foreign sources for certain critical minerals. The 1980 Deep Seabed Hard Mineral Resources Act was passed to facilitate U.S. involvement in developing the seabed mineral resources. At present, however, continued U.S. involvement is quite uncertain.

The uncertainty stems from strong opposition, from the mining industry and others, to many of the mining provisions in the United Nations' current draft Law of the Sea Treaty which would govern deep seabed mining in international waters.

In this report, GAO reviews the implementation of the 1980 act; and analyzes the major impediments to U.S. involvement in deep seabed mining, particularly as they relate to the draft Law of the Sea Treaty, and offers recommendations to the Congress to overcome them.

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The President of the Senate and the
Speaker of the House of Representatives

This report discusses impediments to U.S. participation in developing the vast mineral resources on the deep ocean floor, and offers recommendations to the Congress to help overcome those impediments.

We made this review because of the considerable congressional interest in using the seabed minerals to augment the Nation's supply sources.

We did not obtain agency comments on this report, because, at the time we were completing the study, the administration was reconsidering its stance on the draft Law of the Sea Treaty and had not taken an official position on it.

Copies of this report are being sent to the Secretaries of Commerce, State, and the Interior; the Administrator, National Oceanic and Atmospheric Administration; and the Director, Bureau of Mines.

Charles A. Bowsher

Comptroller General
of the United States

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COMPTROLLER GENERAL'S
REPORT TO THE CONGRESS

IMPEDIMENTS TO U.S. INVOLVEMENT IN DEEP OCEAN MINING CAN BE OVERCOME

D I G E S T

The world's deep seabeds contain enormous quantities of potato-shaped, metal-bearing nodules--referred to as "manganese nodules"--which contain potentially valuable deposits of manganese, nickel, copper, and cobalt. Some 20 to 30 other elements, which are not presently considered to be economically recoverable, are found in the nodules in varying amounts. (See p. 5.)

The United States is heavily import-dependent for nickel, manganese, and cobalt, which have all been identified as critical and strategic materials under the Strategic and Critical Materials Stockpiling Act (50 U.S.C. 98 et seq.). In 1980, imports of these three commodities alone totaled over 1 billion dollars. (See p. 5.)

Increasingly concerned about future availability of minerals essential to the U.S. economy and national defense, the Congress passed the Deep Seabed Hard Mineral Resources Act of 1980 (P.L. 96-283, June 28, 1980) to facilitate orderly development of the deep ocean resources by U.S. companies pending satisfactory conclusion of the United Nations' sponsored Law of the Sea Treaty. (See p. 1.)

The mining industry has invested hundreds of millions of dollars to develop seabed mining technology to recover the mineral resources. In recent years, however, that investment has declined markedly, primarily because the industry, with considerable congressional support, contends that the current draft Law of the Sea Treaty does not offer sufficient protection for further mining investment. (See p. 1.)

GAO undertook this review to provide the Congress with information it may need in

ensuring proper implementation of the 1980 Act, in offering policy guidance to the administration on the Law of the Sea Treaty negotiations, and in responding to administration initiatives concerning those negotiations.

FINDINGS

GAO found that full implementation of the 1980 Act is inextricably tied to the status of the Law of the Sea Treaty negotiations. The first stated objective of the Act is to encourage successful conclusion of the treaty. The Act also provides for continued seabed mining technology development and actual mining operations pending conclusion of the treaty. (See p. 45.)

The status of the treaty and, therefore, full implementation of the Act presently are quite uncertain. GAO believes that the goals of the 1980 Act are important and worth striving for and that the Nation's interests in augmenting reliable mineral supply sources can best be served if it is a party to a comprehensive Law of the Sea Treaty, but only an amended treaty that properly addresses U.S. interests. (See p. 45.)

Opposition to the draft Law of the Sea Treaty has principally been focused on:

--Access to mine sites. The mining consortia believe that they must have guaranteed access to mine sites after they have gone to the expense of exploring them. (See p. 15.)

--Long-term investment protection. The consortia do not believe the current draft treaty adequately assures that they will have reasonable mining opportunities beyond the first generation mines. (See p. 17.)

--Interim investment protection. The consortia's considerable prior investment in seabed mining technology will stop unless their investments are protected. (See p. 19.)

--Production controls. The consortia fear that these controls may preclude the possibility of making a fair market return on their investment. (See p. 20.)

--Technology transfer. The consortia oppose mandatory technology transfer on both legal and financial grounds. (See p. 23.)

--Dispute settlement. The consortia believe that dispute-settling mechanisms in the draft treaty will tend to favor developing countries. (See p. 28.)

The mining consortia are supported in their opposition by many members of the Congress and the administration.

GAO analyzed each of these areas and believes that in some of the cases, the industry concerns are valid and their interests are not being adequately protected. In other cases, however, GAO believes the concerns either are not as serious as portrayed or are premature in that they have not yet been fully negotiated.

If there is a resurrection of U.S. deep seabed mining activity, assuming that the major impediments to further U.S. involvement are overcome, GAO feels that the Congress should evaluate current industry plans for mining and disposing of four principal nodule minerals. If it is determined that those mining plans, which, as now formulated, call for disposal of manganese, are not consistent with the intent of the 1980 Deep Seabed Hard Mineral Resources Act, the Congress should consider amending the legislation to assure the conservation of such strategic and critical minerals as manganese. (See p. 49.)

With respect to the environmental provisions of the 1980 deep seabed mining act, GAO found that the National Oceanic and Atmospheric Administration (NOAA) has done considerable work on the required environmental assessments. If the United States proceeds with deep seabed mining, it will be up to the Congress to ensure sufficient appropriations to adequately assess all environmental impacts. (See p. 49.)

RECOMMENDATIONS TO THE CONGRESS CONCERNING THE LAW OF THE SEA TREATY

The role of the Congress has been critical to seabed mining activities in the United States, and the Congress will continue to be instrumental in determining U.S. approaches. GAO recommends that the Congress:

--Accept reasonably assured access to mine sites. The Congress should accept the fact that guarantees for access to mine sites are unrealistic in the absence of sovereign rights to mineral resources; that the absence of such absolute rights is not in itself a fundamental shortcoming of the draft treaty; and that reasonable access can be provided under provisions of the draft treaty, especially since the specific implementing rules and regulations have yet to be negotiated. (See p. 50.)

--Insist on long-term investment protection. The overall viability of seabed mining is contingent upon access to mine sites beyond first generation mining, and reasonable assurances for that access must be pursued. The Congress should insist that the "Review Conference" not be capable of fundamentally altering the terms of access. (See p. 50.)

--Reassert the need to protect interim investments. The Congress has agreed, through the 1980 Act, to the need to assure that investments made prior to entry into force of a treaty should be protected. (See p. 51.)

--Insist on alternative means of protecting developing countries' economies. The objective of protecting these economies, sought with inclusion of production controls in the draft treaty, warrants congressional support. But, because the current production control provisions would be cumbersome to apply and perhaps counterproductive to investment, and certainly not the only means of achieving the objectives, the Congress should insist on the careful development of alternatives for achieving

income protection objectives while minimizing disincentives. (See p. 51.)

--Ensure that compensation for transferred technology is adequate to protect the developer's investment, and that recipients of proprietary technology safeguard it against unauthorized disclosure. (See p. 51.)

--Concentrate now on minimizing issues potentially subject to dispute settlement procedures. GAO does not believe that acceptability and/or feasibility of dispute settlement mechanisms can be realistically divorced from the nature and number of issues which might have to be subject to formal dispute settlement procedures. (See p. 51.)

OTHER RECOMMENDATIONS TO THE CONGRESS

On the assumption that the United States proceeds with the Law of the Sea Treaty process, GAO recommends that the Congress:

--Make sure that industry plans for mining and disposing of all four primary nodule minerals are evaluated and monitored for consistency with conservation goals of the 1980 Act. Efforts to continue or expand Federal research and development into new markets for manganese should be considered. (See p. 51.)

--Make sure that appropriate support for environmental research is available for NOAA's Office of Ocean Minerals and Energy, consonant with environmental assessment activity mandated by the 1980 Act and necessary prior to commercial recovery operations. (See p. 51.)

--Direct that NOAA carry out assessments of industry mining activities. Of particular concern should be activities which evaluate the impacts of new engineering and equipment. (See p. 52.)

At the time GAO was completing this study, the administration was having the draft Law of the Sea Treaty reviewed and had not taken an official position on it. For that reason, GAO did not obtain agency comments on this report.

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ABBREVIATIONS

CLSP - Center for Law and Social Policy

DOMES - Deep Ocean Mining Environmental Study

GAO - General Accounting Office

NOAA - National Oceanic and Atmospheric Administration

OOME - Office of Ocean Minerals and Energy

PEIS - programmatic environmental impact statement

UNCITRAL - United Nations Conference on International Trade Law

CHAPTER 1

INTRODUCTION

Increasingly concerned about future availability of minerals essential to the U.S. economy and national defense, the Congress passed the Deep Seabed Hard Mineral Resources Act of 1980 (P.L. 96-283, June 28, 1980) in an effort to encourage commercial recovery of abundant mineral resources found on the deep ocean floor. The Act was to facilitate orderly exploration and development of the deep ocean resources by U.S. companies pending satisfactory conclusion of the United Nation's sponsored Law of the Sea Treaty which, when formally ratified, would govern treaty signatories' development of these resources.

Due to widespread congressional interest in these issues, we evaluated the status of implementation of the 1980 Act and impediments to achieving its objectives. We found that some progress was being made, but not all objectives of the Act were being achieved. The major impediments to continued U.S. involvement in deep sea mining stem from strong industry, congressional, and administration opposition to many of the mining provisions in the draft Law of the Sea Treaty. We agree that a number of the provisions need modifications and offer recommendations to the Congress to help remove these impediments.

PROBLEMS CONFRONTING OCEAN MINERAL DEVELOPMENT

In addition to generally poor market prices and high interest rates that have discouraged investment, there are two primary factors limiting recovery of ocean minerals. In the first place, deep seabed mining is a very expensive venture for which all necessary technology has not yet been developed. Secondly, there are unresolved legal questions regarding ownership of resources in international waters.

Due to the very high costs of developing the necessary technology to explore and recover deep seabed minerals, companies have banded together to form multi-national consortia in order to reduce costs and share the risks. As shown in table 1, there currently are four major ocean mining consortia in which U.S. companies are involved.

Although the consortia have invested hundreds of millions of dollars to develop the technology necessary to explore and mine the deep seabed, much remains to be done. Current estimates are that it will take at least 10 years and over one billion dollars before a full-scale commercial mining operation could be in place.

Concerning the legality of mining the seabed, the unilateral recovery of seabed mineral resources by any nation is the subject

TABLE 1

Major Mining Groups

Ocean Mining Associations (OMA) DEEPSEA Ventures, Inc.	*Percentage share holdings in outstanding commom Stoek (at present wholly owned by US natls)*	Ocean Management, Inc. (OMI)	*Nationality*
Essex Minerals Co. (U.S. Steel)	19.35%	International Nickel (INCO), Ltd.	Canada
Union Seas, Inc. (Union Miniere S.A.-Belgium)	19.35%	AMR (composed of Metallgesellschaft AG, Preussag	
Sun Ocean Ventures, Inc. (The Sun Company-U.S.)	19.35%	AG, & Salzgitter AG)	FRG
Samim Ocean, Inc. (Societa Azionaria Minero Metallurgica S.P.A., E.N.I.-Italy)	19.35%	Deep Ocean Mining Co., Ltd. (DOMCO) (composed of Sumitomo, Nippon Mining,	
Tenneco Corporation (Tenneco Inc.-U.S.)	22.60%	Dows Mining, and others)	Japan
		SEDCO, Inc.	USA

Kennecott Corporation (Operator)	*Nationality*	Ocean Minerals Company (OMCO)	*Nationality*
Kennecott Corporation	USA	Amoco Ocean Minerals Co. Standard Oil Co. of Indiana)	USA
Rio Tinto Zinc Deep Sea Mining Enterprises, Ltd.	UK	Lockheed Systems Co., Inc (Lockheed Corporation)	USA
Consolidated Gold Fields, Ltd.	UK		
Noranda Exploration, Inc.	USA	Ocean Minerals, Inc.	
Mitsubishi Corporation	Japan	composed of:	
British Petroleum Development, Ltd.	UK	Lockheed Missiles & Space Co. Inc. (Lockheed Corporation)	41.1% USA
		Billiton, B.V. (Royal Dutch/Shell)	45.5% UK/Neth.
		BRW Ocean Minerals (Royal Bas Kalis Westminister Group N.V.)	13.4% Netherlands

NOTE: Pursuant to the purchase of Kennecott Corp. by Standard Oil of Ohio, in which B.P. Ltd. holds 53 percent interest, B.P. has majority control of the Kennecott group.

SOURCE: Data in table 1 extracted from Soundings, The United Methodist Law of the Sea Project, Vol VI, No. 1, April-May 1981...

of dispute. The guiding theme of the Law of the Sea Conference, as it pertains to seabed resource recovery, has been the 'common heritage of mankind' concept. This concept was first brought to the attention of the United Nations in 1967, and subsequently set forth in the 1970 "Declaration of Principles Governing the Sea-Bed and the Ocean floor, and the Subsoil thereof, beyond the Limits of National Jurisdiction," United Nations General Assembly Resolution 2749 (XXV). While the common heritage concept has received prominent attention, there has never been any kind of consensus on its definition. In fact, a stated objective of the 1980 Deep

Seabed Hard Mineral Resources Act is to encourage successful conclusion of the Law of the Sea Treaty wherein the common heritage concept will be given legal definition.

In view of the many years of investment yet needed to develop the technology to recover seabed minerals on a commercial scale, the Congress determined that domestic legislation was necessary to encourage continued investment so that these minerals could be available when needed. Consequently, the 1980 seabed mining act was passed to establish an interim legal regime under which technology development and mineral exploration and recovery involving U.S. companies could proceed pending final resolution of a Law of the Sea Treaty. That resolution is quite uncertain at this moment. Private industry investment to develop seabed mining technology has markedly declined. The primary reason is that the mining industry, with considerable congressional support, contends that the current draft treaty does not offer sufficient protection for further mining investment. This is a main reason why the administration is having the entire treaty restudied.

Pending ratification of the Law of the Sea Treaty, which could take as long as six or seven years after the treaty negotiations have been successfully resolved, the National Oceanic and Atmospheric Administration (NOAA), under the authority of the 1980 act, has proceeded to conduct environmental assessments and establish licensing procedures to govern exploration and development of deep seabed mineral resources by U.S. firms. In addition, NOAA has initiated actions to establish a "reciprocating states agreement," required by the 1980 act, under which nations having the capability to mine the deep seabed would agree to respect the mining claims of other such nations.

Along with the licensing procedures, the reciprocating states agreement was seen as a desirable part of an interim legal framework to permit seabed mining pending adoption of an international treaty. Current parties to reciprocating states negotiations include the United Kingdom, France, Belgium, Japan, the Netherlands, and West Germany. Progress has been made in developing these interim procedures, and the countries involved have been considering using them as a longer term 'mini treaty'. Whether seabed mining operations, especially commercially financed U.S. operations, would take place under them in the absence of a comprehensive Law of the Sea Treaty is highly uncertain. As discussed in chapter 3, the principal financial institutions that underwrite seabed mining ventures told us they would not finance further technology development or actual mining operations--which was envisioned under the 1980 act--without a satisfactory Law of the Sea Treaty, and that they did not consider the reciprocating states agreement as a viable alternative. In addition, during a November 1981 briefing of the President's Law of the Sea Advisory Committee, his Special Representative to the Law of the Sea Conference indicated the strong likelihood that without a Law of the Sea Treaty, to which the United States is signatory, "there will be no seabed mining industry in the United States."

According to participants and observers at the Law of the Sea Treaty negotiations, it is increasingly likely that a United Nations' sponsored treaty will be concluded and ultimately ratified. The key questions are whether the United States will be a signatory to that treaty, or whether it will contemplate further support for some form of a reciprocating states "mini treaty."

BACKGROUND

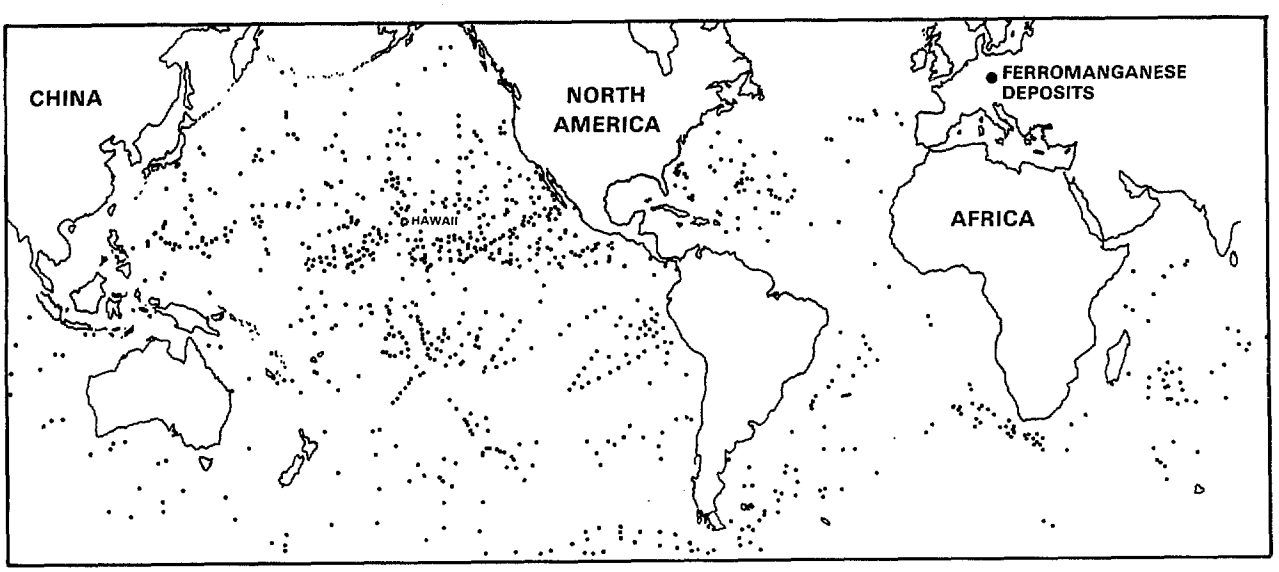
Known land-based resources of minerals worldwide are adequate to meet the demands of a growing world economy for many years to come. However, access to these minerals is less certain, particularly in the case of those for which the United States is highly import-dependent.

Deep ocean mining has received widespread attention in recent years because the seabed offers a potential increased supply of minerals currently important to the U.S. economy and national defense; it offers the potential to improve the U.S. balance of payments position; and it offers a diversity of supply for minerals upon which the United States is highly import-dependent.

Ocean mining involves the commercial recovery of metal-bearing nodules (referred to as "manganese nodules") which are found on the world's seabeds. Primary commercial interest is in those nodule deposits found in three to five miles of water. These deep seabeds, ocean areas beyond national jurisdictions, constitute vast areas estimated at about one half the earth's surface. World distribution of manganese nodules is shown in figure 1 below.

FIGURE 1

WORLD DISTRIBUTION OF SURFICIAL MARINE MANGANESE NODULE DEPOSITS BASED ON CORE AND DREDGE DATA



Source: Horn, D., B. Horn, and M. Delach, 1972. Worldwide Distribution and Metal Content of Deep-Sea Manganese Deposits in Manganese Nodules in the Pacific, Symposium/Workshop Proceedings, October 16-17, 1972. Department of Planning and Economic Development, State of Hawaii, pp. 46-60.

These areas contain enormous quantities of the potato-shaped nodules which contain potentially valuable deposits of manganese (about 24 percent by volume), nickel (about 1 percent by volume), copper (about .53 percent by volume), and cobalt (about .35 percent by volume). Metal content varies, however, from one location to another. Some 20 to 30 other elements, which are not presently considered to be economically recoverable, are found in the nodules in varying amounts. Estimates are that U.S. requirements for the four major minerals could be totally met for decades with commercial recovery of manganese nodules.

The United States is heavily import dependent for nickel, manganese, and cobalt. In recent years, we have imported about 98 percent of our cobalt, principally from Zaire; about 97 percent of our manganese, principally from Gabon and South Africa; and about 73 percent of our nickel, principally from Canada. In 1980, imports of these commodities alone totaled over 1 billion dollars. The three minerals have all been identified as critical materials under the Strategic and Critical Materials Stockpiling Act (50 U.S.C. 98 et seq.). Manganese is an essential component in iron and steel production. Cobalt is critical to the basic tools industry and in applications such as high-temperature resistant alloys for jet engines. Nickel is critical because it imparts corrosion resistance, strength, and other properties to alloy steel.

It is worthwhile noting that the economic attractiveness of the seabed as a source of increased world nickel production capacity is enhanced by the prospect of difficulties with future land-based production. According to a Canadian mining company official (Canada is the world's leading nickel producer), maximum new land based world supply is estimated at about 1.6 billion pounds of nickel per annum, plus about 100 million pounds of anticipated "definite" capacity additions. (Total world production in 1980 was 1.44 billion pounds.) He stated that should additional land-based production capacity be required

> "* * * it will be expensive capacity. This relates to the preponderance of laterites in the world nickel ore reserve picture, and the expense incurred in both developing (remote locations) and operating (energy costs) these deposits. For just these reasons, there are no major nickel projects scheduled to get "off the drawing board" beyond the 100-plus million pounds of additions mentioned earlier."

The Congress has long been interested in the commercial recovery of seabed minerals to reduce U.S. dependence on the export policies of other countries. Recognizing that America's industrial and defense mineral requirements will continue to expand and that dependence on foreign minerals will continue to be risky, the Congress has promoted the development of the deep seabed metal-bearing nodules.

Additionally, through the expenditure of hundreds of millions of dollars, private industry has demonstrated a long-standing interest and commitment to develop ocean mineral resources.

PRIOR STUDIES

We have issued a number of reports on this general subject. In a 1976 report 1/, we addressed the need to complete NOAA's environmental assessment studies to resolve environmental impact questions. In a 1978 report 2/, we identified the need for domestic legislation to resolve potential seabed mining constraints having to do with guaranteed site tenure and environmental impact assessments. In addition, we have issued a series of reports on the continuing Law of the Sea Treaty negotiations.

CONGRESSIONAL INTEREST

Since 1971, when the first deep seabed mining bill was introduced, legislation has been introduced in every Congress from the 92nd through the 96th when the 1980 Act was passed and signed. 3/ Bills have been introduced and hearings held by over a dozen committees and subcommittees during that period.

A 1980 report 4/ of the Defense Industrial Panel of the House Armed Services Committee reflects the nature not only of defense industry concerns but also of general congressional interest in developing alternative supply sources:

> "A shortage of critical materials, combined with a resulting dependence on uncertain foreign sources for these materials, is endangering the very foundation of our defense capabilities. These shortages are a monumental challenge to the Congress, the Department of Defense, the defense industry, and the civilian economy."

Given this widespread congressional interest in recovering deep seabed minerals and in accomplishing the objectives of the

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1/"Deep Ocean Environmental Study--Information and Issues," PSAD-76-135, Sept. 21, 1976.

2/"Deep Ocean Mining--Actions Needed to Make it Happen," PSAD-77-127, June 21, 1978.

3/Appendix I shows the progress of seabed mining legislation since the introduction of the first mining bill in 1971 to passage of P.L. 96-283.

4/"The Ailing Defense Industrial Base: Unready For Crisis," Committee on Armed Services, House of Representatives, Committee Print No. 29, Dec. 31, 1980, p. 1.

1980 deep seabed mining act, and given the uncertainty of the administration's position on the pending Law of the Sea Treaty, we undertook this review to provide the Congress with information it may need in responding to administration initiatives.

The Chairman and the ranking minority member of the National Ocean Policy Study, administered by the Senate Commerce Committee, and the Chairman of the Subcommittee on Mines and Mining of the House Interior and Insular Affairs Committee have requested that we provide them with the results of the review.

OBJECTIVES, SCOPE AND METHODOLOGY

In this study, we sought to determine whether the Congress' stated purposes in passing the 1980 deep seabed mining act were being achieved and to identify the primary impediments to their successful implementation.

Stated purposes of the act are:

--To encourage successful conclusion of a Law of the Sea Treaty.

--To establish an international revenue sharing fund.

--To establish an interim program to regulate exploration and commercial development of seabed minerals.

--To accelerate necessary environmental assessment programs, and encourage the conservation of such resources while promoting the safety of life and property at sea.

--To encourage continued development of necessary mining technology.

While we did not attempt to evaluate the overall merits of the Law of the Sea Treaty, we did analyze those provisions dealing with seabed mineral development that most appeared to stand in the way of realizing congressional objectives.

In the event that an acceptable Law of the Sea Treaty cannot be negotiated, other options might be available. Some form of the previously mentioned reciprocating states alternative might be considered an option to the treaty, and be extended beyond its originally intended interim scope. There are other options which are outside the scope of this study. For example, the United States might depend on access to deep ocean mineral supplies through an international authority or mining consortia headquartered in other countries, or it might rely on alternative forms of government-to-government negotiations and agreement as to how deep ocean mining might be sponsored and protected, either through private sector agents or governments directly. These two options would surface sets of issues for government policy decisionmaking requiring

analyses and assessments different than and independent from the kinds of issues considered in this report.

Ultimately, the viability of any option could be determined by how critical the Nation perceives the need for developing alternative mineral supply sources. This study, however, does not attempt any mineral-specific assessment of criticality.

During the course of the review, we had interviews with and reviewed documents provided by officials from the Departments of Commerce, State, the Treasury, and the Interior; the Congressional Research Service; the American Mining Congress; industry trade associations; investment bankers; House and Senate committee staff members; officials of the United Nations; academic institutions actively involved in seabed mining issues, such as the Center for Ocean Law and Policy at the University of Virginia, and the Ocean Coastal Law Program at the University of Miami School of Law; the four principal ocean mining consortia; and representatives from concerned environmental groups, notably the Center for Law and Social Policy.

Our review addresses policy and related actions deserving congressional attention if commercial recovery of seabed mineral resources is to become technically and economically feasible during the coming decade. This was the intent of the 1980 Act.

We identified three problem areas that we believe are most deserving of congressional attention and further policy guidance as they are impediments to deep seabed mineral resource recovery. Of top priority were present impediments to successful conclusion of a Law of the Sea Treaty. Issues related to resource conservation and protection of the ocean environment were also deemed in need of priority congressional review. We found that progress was being made toward other policy objectives of the 1980 Act, such as establishing an interim revenue sharing fund, licensing procedures, and the reciprocating states agreement.

The Congress will continue to play a major role in developing policy guidelines for ocean mineral development because of its involvement in the Law of the Sea Advisory Committee, review and evaluation of the new administration's position on the Law of the Sea Treaty, treaty ratification hearings, and implementing legislation. These responsibilities provide the Congress with a continuing opportunity to assure that the commercial recovery of seabed mineral resources is realized in the most orderly manner.

In chapter 2, we address those provisions of the Law of the Sea Treaty that are impediments to successfully concluding the treaty. Chapter 3 addresses the availability of capital to finance the development of seabed mining technology and, eventually, seabed mineral exploration and development. In chapter 4 we address the need to ensure that seabed mining operations do not inadvertently cause the waste of other potentially valuable mineral resources.

Chapter 5 addresses the environmental aspects of seabed mining and the progress NOAA has made in assessing environmental impacts. Chapter 6 presents our conclusions and recommendations.

CHAPTER 2
PROBLEMS ENCOUNTERED IN COMPLETING A COMPREHENSIVE LAW OF THE SEA TREATY

In 1970, the United Nations' General Assembly adopted Resolution 2749 which stated that "the seabed and ocean floor and subsoil thereof beyond the limits of national jurisdiction, as well as the resources of the area, are the common heritage of mankind," and that "no state or person natural or juridical shall claim, exercise, or acquire rights with respect to the area or its resources incompatible with the international regime to be established and the principles of this declaration." The United States supported this declaration of concepts, while still maintaining in principle the right of U.S. companies to engage in mining the deep seabed.

By passing the 1980 deep seabed mining act, the Congress concluded ten years of effort to pass domestic legislation which, among other goals, was intended to facilitate the successful completion of a United Nations Conference on the Law of the Sea. Negotiations at the United Nations, however, are facing an uncertain future mainly because of strong opposition to certain draft treaty provisions from private industry, many members of the Congress, and members of the administration.

The draft Law of the Sea Treaty is generally seen by developing countries as adequate to meet their concerns about seabed mineral development. In addition, previous U.S. negotiators, though agreeing that certain flaws in the treaty text need to be overcome, see the text as an unprecedented achievement in multilateral negotiation, accommodating diverse national interests.

In this chapter, we discuss the current status of the Law of the Sea Treaty, and the major concerns over the treaty's mining provisions that have prompted the U.S. Government to reevaluate it.

BACKGROUND AND STATUS OF THE LAW OF THE SEA TREATY

The Third 1/ Law of the Sea Conference was convened in 1973 with a primary goal, among others, of formulating a legal international regime to govern the exploration and recovery of seabed resources beyond national jurisdictions. Through seven years of negotiations, agreement has been reached on many other important issues while seabed mining issues have proved most difficult to resolve.

The difficulty of negotiating an acceptable treaty among more than 150 nations representing a wide diversity of levels of economic

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1/The current Law of the Sea Conference is the third plenipotentiary meeting sponsored by the United Nations to draft a treaty addressing certain unresolved problems developing from the increased use of the oceans.

development and national interests is apparent. The difficulty is magnified by basic conflicting objectives regarding seabed mineral resources. Developing nations which are land-based producers of these commodities look upon the seabed minerals as a threat to their economies, whereas the major consumers of the commodities look upon seabed development favorably, because it can ultimately reduce their costs.

Developing countries have sought from the beginning of Law of the Sea negotiations to assure that a system evolved which would guarantee them economic benefits from seabed mining operations and provide the technological capability to mine the seabed themselves. They have fought hard for a strong voice in managing seabed mineral development as well as for means to protect developing country land-based producers of minerals which would face competition from development of ocean resources.

In 1976, the Secretary of State responded to developing country seabed mining concerns by making proposals aimed at development of a "parallel system," whereby seabed mineral development could proceed both by private or national firms as well as under the auspices of an international mining regime representing the interests of all nations. These proposals included means for financing an international authority to govern seabed mining, means for assuring the availability of technology for these countries, and procedures for setting up conferences to review major provisions of a comprehensive international treaty. Earlier in 1976, the United States had proposed establishing mechanisms to limit production during an initial temporary period.

Since 1976, negotiations have centered on efforts to assure that the interests of all countries are represented in a basic "parallel system." The current draft treaty reflects compromises between the demands that developing and developed countries have made. The treaty provisions have all been carefully negotiated with the objective of balancing the national interests of about 150 nations without, at the same time, constituting an unmanageable framework for commercial recovery. Although mining company officials have tried to assure that access to mine sites would be guaranteed under treaty provisions, and that the opportunity to make a fair market value return would not be precluded, they contend that their continuing efforts to develop the technology needed to mine the seabeds are severely impaired due to the impending draft text. Some industry representatives oppose the basic tenets of the "parallel system." However, mining company representatives principally object to the way that the parallel system is to be implemented in the current draft treaty.

The fundamental conflict over the adequacy of the protection of United States interests has resulted in at least a temporary standstill in the negotiations. The United States has asked for "time out" so that the new administration can have the opportunity to thoroughly reevaluate the current draft treaty. The administration's decision to reevaluate the treaty stems mainly from strong

congressional, private industry, and administration concerns that the treaty, as now written, would not be in the United States' best interest. Consequently, the ability to conclude a treaty which is acceptable to the international community while providing adequately for U.S. interests, as well as the interests of the seabed mining consortia, is currently uncertain.

PROPOSED UNITED NATIONS' ORGANIZATION TO GOVERN SEABED DEVELOPMENT

As currently proposed in the draft Law of the Sea Treaty, deep seabed mineral development would be governed by an International Seabed Authority (see figure 2) consisting of an Assembly, a Council, a Secretariat and an Enterprise. The Assembly is the supreme organ which provides general policy direction, elects the Council, elects the Secretary-General to run the Secretariat, and elects the Governing Board and Director General of the Enterprise. The Council is the executive organ of the Authority, responsible for supervising and coordinating implementation of the treaty, issuing directives to and exercising control over Enterprise activities, etc. The Secretariat provides administrative support, and the Enterprise is the operating arm of the Authority.

Additionally, means are established by the draft treaty for settling disputes between parties or disputes relating to the interpretation or application of the comprehensive treaty.

All signatory nations to the Law of the Sea Treaty are members of both the International Seabed Authority and its related Assembly.

The Council will consist of 36 members of the Authority elected by the Assembly. Each member of the Assembly has one vote. The election is to take place generally as follows:

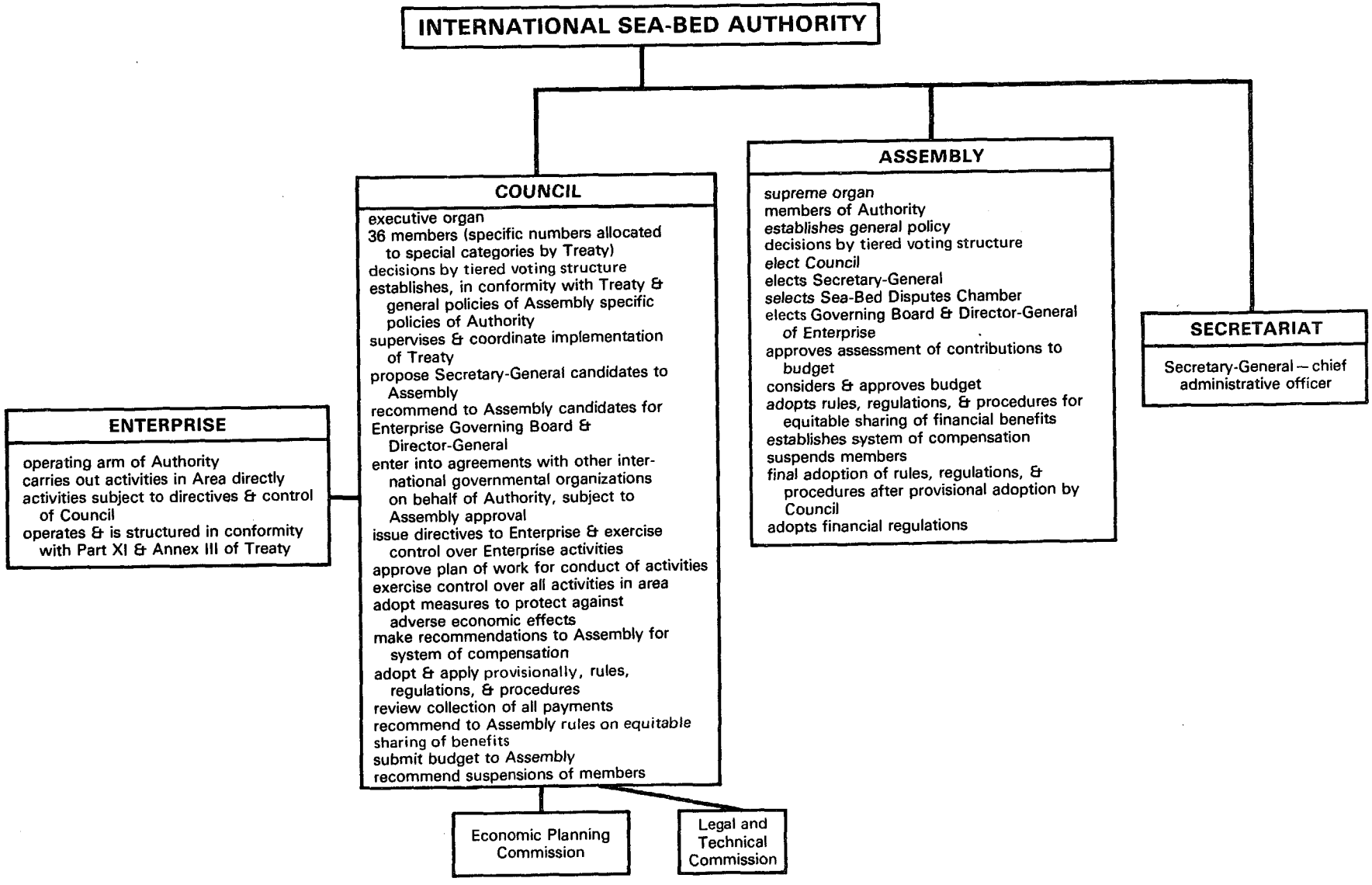
--Four members from among the nations having the largest investments in deep ocean mining, including at least one "Eastern (Socialist) European" nation.

--Four members from among those major consuming and/or importing nations, including one "Eastern (Socialist) European" nation.

--Four members from among the major exporting nations of those minerals to be mined from the seabed, including "at least two developing countries whose exports of such minerals have a substantial bearing upon their economies..."

--Six members from among developing nations representing special interests including large populations, landlocked or geographically disadvantaged, major importers of the minerals to be mined on the seabed, potential producers of such minerals, and least developed nations.

INTERNATIONAL SEABED AUTHORITY
ORGANIZATION AND FUNCTIONS



SOURCE: Draft Convention on the Law of the Sea, October 1, 1981

--Eighteen members to assure equitable geographical distribution with at least one member each from Africa, Asia, Eastern Europe (Socialist), Latin America and Western Europe and others.

The nominations for Council seats will be made through a "caucus nomination" process; whereby, the members of the categories listed above will nominate candidates from among their group. This is to assure that each group's interests are represented.

As indicated, "Eastern (Socialist) European" nations are guaranteed at least three seats on the Council. Many of those who oppose the mining provisions in the current draft treaty see this as another potentially harmful situation for U.S. interests. They believe this may lead to a voting imbalance on the Council and could ultimately affect the access of U.S. mining companies to the seabed minerals since there is no assurance the United States will be represented on the Council.

The Enterprise shall, at the direction and control of the Council, directly carry out activities including mining, transporting, processing, and marketing seabed minerals.

The Enterprise is envisioned as representing the interests of all nations. It will have the right to purchase most of the mining technology employed by the mining consortia, and will receive considerable funding in the form of application fees, ground rents, production charges, and profit-sharing charges that the mining consortia would be required to pay.

The funding and technology transfer provisions of the draft treaty are designed so that the Enterprise can undertake actual mining operations. This is to assure that developing nations can participate in and benefit from the mining itself rather than simply share in royalties paid by the mining consortia.

MAJOR OBJECTIONS TO MINING PROVISIONS OF DRAFT TREATY

The key concerns raised by the seabed mining consortia to the currently defined parallel system have to do with:

--Access to mine sites. The consortia believe that they must have guaranteed access to mine sites after they have gone to the expense of exploring them. They contend that the present draft treaty does not give this guarantee.

--Long Term Investment Protection. The consortia do not believe the current draft treaty adequately assures that they will have reasonable mining opportunities beyond the first generation mines.

--Interim investment protection. The consortia have made considerable investment in developing seabed mining technology, but say these investments will stop unless

they are given adequate assurances that they will be able to recover costs incurred on mine sites prior to entry into force of an international accord.

--Production controls. The current draft treaty provides for production controls to protect the land-based mineral industries. The consortia fear that these controls may preclude the possibility of making a fair market return on their investments.

--Technology transfer. The treaty provides for mandatory transfer of technology at "fair and reasonable commercial terms and conditions" to the Enterprise and to developing countries. The consortia oppose this on both legal and financial grounds.

--Dispute settlement. The draft treaty provides several means for resolving any disputes. The consortia believe these dispute-settling mechanisms will tend to favor developing countries.

Access to Mine Sites

The draft treaty reflects the need for "the enhancing of opportunities for all States Parties, irrespective of their social and economic systems or geographical location, to participate in the development of the resources of the Area and preventing of monopolization of activities in the Area." Since the resources belong to all mankind, no "State or natural or juridical person shall claim, acquire or exercise rights with respect to the minerals of the Area except in accordance with the provisions of this Part."

While the United States accepts the concept of common heritage regarding these resources, it requires, under the 1980 deep seabed mining act, that any international agreement to which the United States becomes party must "provide assured and nondiscriminatory access, under reasonable terms and conditions, to the hard mineral resources of the deep seabed for United States citizens..."

Exploration activities as provided for in the draft treaty are to be carried out under a plan of work approved by the Council. Exploration is to be carried out only in areas specified in the plan of work, and under rules, regulations, and procedures specified therein. The plans confer on the operator exclusive rights for the exploration of the specified categories of resources in the specified area. However, each application for a mine site will be for an area sufficiently large to support two separate mining operations, one of which (the "reserved" site) will be set aside solely for the conduct of activities by the Authority. Applicants' plans of work will be evaluated on the basis of compliance with basic rules and regulations, nationality of applicant, financial and technical capabilities of the applicant, and acceptance of control by and policies of the Authority with respect to activities in the area.

In the view of some mining industry officials, after bearing exploration costs, the applicant has no assurance that the Enterprise will not be able to mine even the 'unreserved' site. We believe that for the Authority not to allow the exploring firms or consortia to develop the unreserved site would be contrary to the basic premises on which the parallel system was established. Further, the treaty provides that even the reserved area shall not be designated as such, until a plan of work for the nonreserved area is approved and the contract actually signed.

A second major "access" problem concerns decisionmaking on applications for access to mine sites. The Council's Legal and Technical Commission will review and make recommendations on all applications for access. Although the current text provides for virtually automatic approval of contracts that are recommended for approval by the Legal and Technical Commission, the outcome of the Commission's decisionmaking process itself remains the greatest threat to assured access to mine sites.

In the Council, there is a tiered voting structure requiring approval anywhere from a simple majority up to a consensus depending on the importance of the particular issue. Consensus issues currently include proposed measures to protect developing countries from adverse effects on their economies due to seabed mining (i.e. production controls); revenue sharing measures; rules and regulations relating to prospecting, exploration and exploitation of the area; and amendments regarding the seabed mining provisions.

Any nation having a seat on the Council would be able to block the vote on any consensus issue. While the members of the Council have not been selected and there is no assurance that the United States or any other specific nation will have a seat, the draft treaty does assure that Eastern European (socialist) nations will have at least three seats. As discussed on p. 12, the draft treaty also assures that the Council membership will include nations with similar interests to the United States, if not the United States itself. Many believe having like minded nations on the Council would assure that U.S. interests are adequately protected on consensus voting issues. Others, however, believe that the United States must have a guaranteed Council seat in order to protect its interests. The anticipated admininstration position will be to strive for direct U.S. representation on the Council.

If the Legal and Technical Commission recommends approval of an application, the Council will approve the plan unless a Council member makes a written objection charging noncompliance with basic qualification requirements. After a conciliation process, the only way for the Council to overturn a Commission recommendation to approve a plan would be by a consensus (excluding the sponsoring state) vote for disapproval.

The Legal and Technical Commission, which is charged with reviewing work plans and making recommendations as to approval or disapproval for access, is to be composed of members having qualifications in relevant fields and representing an equitable geographic

distribution. However, given that these members will be elected by the Council, not the Assembly, the Commission's makeup will most likely reflect the Council makeup.

The draft treaty calls for the highest degree of professional competence for Commission members, the application of non-political criteria in their selection, and the provision of explicit reasons for any negative decisions rendered. Although Annex III of the draft treaty identifies procedures to be used by the Legal and Technical Commission, the actual criteria to be employed in Commission decisions on access applications have not yet been clearly defined. Further definition of criteria to be used would reduce uncertainty regarding Commission deliberations. Some believe the logical forum for the clarifications would be the contemplated Preparatory Commission which is to be convened subsequent to draft treaty signature to prepare all rules, regulations, guidelines, etc., required prior to final treaty ratification. Others believe these criteria should be resolved during the treaty negotiations, because it is mandatory for a nation to sign the treaty before it can participate on the Preparatory Commission.

With regard to demands for unrestricted access to mine sites, it appears that the United States is increasingly alone in insisting on such guarantees. According to one source:

> "The question of who is to mine the resources of the Area, and at what pace, will be determined by the system or rules granting access. The question of access in general has already been discussed as it pertains to the relationship between the Enterprise and the mining companies. In addition to a strong North-South disagreement regarding this relationship--and unlike any issue discussed thus far--there is also a significant split among mining nations themselves over access. More specifically, the United States is virtually isolated in the world community in its insistence upon guaranteed access to the Area for all technically qualified enterprises on a nondiscriminatory basis." 1/

Given the nonnational ownership status of seabed mineral resources in waters beyond national jurisdictions, some discretionary power over the disposition of those resources by the International Seabed Authority is to be expected. However, with further definition of criteria to be used by Legal and Technical Commission members (to be established in Preparatory Commission meetings) and if combined with insistence on the application of non-political criteria by Legal and Technical Commission members in evaluating applications, it would appear that nondiscriminatory access could be achieved.

1/ Deep Seabed Resources, Politics and Technology, Jack N. Barkenbus, Macmillan Publishing Co., Inc., 1979, p. 139.

Long-Term Investment Protection

A second major concern of the ocean mining industry pertains to mining beyond first generation ventures. Because of the newness of technology for recovering seabed minerals, and the vast financial outputs for research and development, first generation seabed mining is not projected to provide companies a profit on developmental investments. Fair market return levels of profits may not accrue until second and third generation mining. Consequently, the extent to which mine sites will be available in the future is a major factor in even current private sector investment decisions.

While some assurance that mining companies can continue mining beyond first generation mining contracts is necessary, the draft treaty is open ended in that changes in the basic principles of the parallel system are possible which could deny private mining companies the right to mine independent of the enterprise. The draft treaty provides for "periodic reviews" (every five years after mining begins) of the international regime, and a Review Conference (15 years after mining begins) to consider amendments to the mining system (not to existing contracts).

The purpose of the periodic review by the Assembly is to "undertake a general and systematic review of the manner in which the international regime of the Area established in this convention has operated in practice." The purpose of the Review Conference by the Assembly is to "...consider in detail, in the light of the experience acquired during that period, whether the provisions of the Part governing the system of exploration and exploitation of the resources of the Area have achieved their aims in all respects--taking into particular consideration the interests and needs of the developing States."

The provisions for the Review Conference exist because the developing countries have taken the position that the parallel system must be a temporary one unless there is agreement at the Review Conference to continue it.

The miners state that the Review Conference provisions in the treaty would allow changes in the basic rules in the middle of the game, and that conditions essential for economically viable mining could be altered.

In the periodic review, the Assembly is allowed to adopt measures to improve the regime. Since neither "measures" nor "improvements" are defined, the Assembly appears to be left with a good deal of discretionary power.

The Review Conference has 5 years to come to an agreement about proposed changes. If agreement is not reached at that time, the conference has one more year to decide, by two-thirds vote on proposed amendments, which must then be ratified by two-thirds of the member nations.

Rights under existing contracts are protected against changes from either the periodic reviews or the Review Conference. The

treaty states that contracts "shall provide for security of tenure. Accordingly, it shall not be revised, suspended, or terminated..." except in accordance with certain articles. One article provides for penalties for illegal activities. Another article protects against unwanted revision of contract, stating that "Any contract ...may be revised only with the consent of the parties."

While first generation production is protected from review conference proceedings, we believe the mining companies have a legitimate concern about future access, a concern that must be addressed in future negotiations.

Interim Investment Protection

In passing the 1980 Deep Seabed Hard Mineral Resources Act, Congress cited as a principal objective of the Act that it encourage the continued development of technology necessary to recover the hard mineral resources of the deep seabed. A major impediment to accomplishing this goal has been the lack of any provision that would assure that investments made prior to entry into force of a treaty would be protected under treaty guidelines.

If all parties to the treaty reached full agreement today, it could still take as long as 6 or 7 years before the treaty were ratified and put into operation. This interim period would include a signing ceremony, a 2-3 year period during which the Preparatory Commission will be in session, and whatever time is necessary for individual nations to approve the action (e.g., congressional approval in the United States), final ratification, and signing by 60 member nations to the treaty.

Companies planning to mine the seabeds have made substantial investments in developing seabed mining technology and hardware. Investment has dramatically declined, however, and industry officials maintain that they will not continue their investments during this interim period unless protection is provided for in the treaty.

The 1980 seabed mining act directed the National Oceanic and Atmospheric Administration (NCAA) to "submit to Congress proposed legislation necessary for the U.S. to implement a system for the protection of interim investments that has been adopted as part of an international agreement..." NOAA responded to its legislative mandate in a June 24, 1981, letter to the Congress by citing the need to wait until the makeup of the new U.S. negotiating posture is known before formulating new interim investment protection proposals so they will be consistent with the U.S. negotiating position.

Additional information provided to GAO by NOAA officials reflects the need to

--protect mining company investments made prior to entry into force of a treaty, and

--assure that such mining companies meet all treaty obligations (e.g., revenue sharing, technology

transfer, etc.) that subsequent mining ventures will be responsible for.

The current draft of the treaty contains no provision for interim investment protection. (Such provisions were scheduled to be negotiated in the 1981 spring session of the Conference, but were deferred.)

Production Controls

The draft Law of the Sea Treaty includes production controls to protect the economies of developing countries that are land based producers of the minerals to be extracted through deep seabed mining operations. The United States proposed these controls, which would be limited to a 20-year period, in order to get the land-based producers' support for the "parallel system." While the objective of protecting developing country economies is an important one, the proposed means of doing so are contended by many to constitute a major impediment to efficient and effective mining of the deep oceans.

Proposed controls are linked to the amount of nickel that would be recovered from seabed nodules, because nickel is the key mineral that holds most promise for making seabed mining an economically viable proposition. Production of other nodule metals--such as copper, manganese, and cobalt--is not to exceed levels which could have been produced from the quantity of nodules needed to reach the nickel production limit.

Production controls in the draft treaty limit the total amount of nickel that may be produced from the seabed for a 20-year interim period after the first mine begins production. The complicated formula to determine the actual limit is based on projected growth in world nickel consumption, and would limit seabed nickel production to only an increment of growth in nickel demand (consumption) over that which would otherwise be satisfied from land based production. According to a State Department analysis of the current draft treaty text:

--The basic production control formula is the sum of (1) the tonnage growth of nickel consumption in the five years prior to the first commercial production from the seabed, and (2) 60 percent of the tonnage growth in nickel consumption from the first year of commercial production to the year for which the allocation is being made. The production limit is recalculated during each year of the 20-year interim period, based on the most recent data. Since the application for a production limit may be submitted up to, but not more than, five years prior to the beginning of a company's commercial production, the production limit must be calculated from estimates about future nickel consumption rates. These estimates are made by using a trend line, which projects future tonnage consumption on the basis of the most recent 15 years of past consumption data.

--The basic production limit is modified by provision for a "floor," which was developed to allow at least a minimum level of seabed production even if nickel consumption had been stagnant. If the compound growth of nickel consumption on the trend line is less than 3 percent annually, a new trend line would be calculated as if there had been 3 percent compound annual growth; this trend line would pass through the original trend line value of nickel consumption for the first year of the 15-year data base. The basic production limit formula would then be applied to the new trend line in order to calculate the allotted annual seabed tonnage.

--The application of the "floor" would be subject to the restriction that nickel production from the seabeds may not exceed the total growth of nickel consumption at any time during the interim period. The total growth of consumption is calculated from the original trend line used in the first step of the calculation.

--The production limitation formula implicitly restricts the number of entrants into seabed mining. The formula relates to the maximum volume of nickel that can be produced. Since the Enterprise is guaranteed production for at least one mine site, only 3-4 sites will be available for full-scale commercial production in the first year and at most 15 during the entire 20-year interim period. Five mining consortia from Western industrialized countries have already seriously engaged in prospecting and technology development and will probably require at least 2 mine sites apiece during the interim period. Since the Enterprise, the existing consortia, and Eastern European nations could already account for most of the available seabed mining production, potential new investors are likely to shy away from seabed mining.

Proposed production control provisions have met with severe opposition from both industry and government officials (a) because of the potential impact that they may have on the profitability of what are already high-risk investments; (b) because they have only a tenuous relationship to initial objectives of the provisions; and (c) because their very existence constitutes a deterrent to investment.

While proposed production controls guarantee some share of the market for seabed minerals, and while this share might be increased if demand exceeds projections, there is no assurance that allocations will in fact be increased. By potentially restricting ocean output, scarcity of minerals availability could be induced. Further, production controls relating only to a percentage of increase in overall nickel demand would grant a sanctity for land-based production which would not take into account any consequential changes in the economics of production. The land-based producers' volume of production would be guaranteed regardless of relative costs of production.

As to the second objection, it is difficult to relate the controls as now fashioned to the overall objective of protecting developing country economies since the majority of land-based nickel production is in developed countries. The countries most likely to benefit from nickel controls are the large land-based producers such as Canada and Australia, not the developing countries. Only about one-third of world nickel production comes from developing countries.

Third, the very existence of the production control provisions constitutes a major deterrent to current industry commitments for investments for developing technology and for securing future commercial financing.

Information we obtained through interviews and in reviewing studies 1/ suggests that seabed production would have minor economic impact on any land-based mineral production and that this would most likely be limited to cobalt producers. Conclusions were expressed that absent production controls, copper would be derived from the seabed in such small quantities (less than one percent of world demand) as to negligibly affect prices, and that ocean nickel production would have only slight impact on market prices (could effect developing country nickel production by about 2 percent). It was projected, however, that cobalt could have a significant affect (25-35 percent decline in market prices). Current projections are that seabed manganese will not be competitive with land-based manganese production, as reflected by the fact that three out of the four major consortia do not even plan to recover the manganese.

In the face of the major impediments associated with proposed production controls, and projections suggesting minimal adverse impacts associated with seabed mining, fundamental alternatives warrant serious examination. The objective of protecting developing country economies could still be supported. Following are examples of three alternative options for cobalt, not related to production controls, which might be employed during the 20-year interim period.

First is an option that would entail no production controls but would require all cobalt producers to join in a new international marketing agreement 2/ so that cobalt sales are accomplished with explicit regard for protecting developing country market shares. This option could necessitate producers having to stockpile cobalt at their own expense during periods of less than maximum demand.

1/Reddy, B.J., and J.P. Clark, The Effects of Deep Sea Mining on International Markets for Copper, Nickel, Cobalt and Manganese, Deep Sea Mining, Report on a symposium held at the Massachusetts Institute of Technology, December 1978-January 1979, pp. 107-125. Hollick, A.L., U.S. Foreign Policy and Law of the Sea, Princeton University Press, 1981, p. 292.

2/Market arrangements affecting U.S. commerce would have to be consistent with U.S. laws.

A second marketing alternative would be to restrict sales of ocean produced cobalt to only a percentage of total demand, or a percentage of growth in demand (up to 100 percent) over a defined base volume. Producers would have to judge on their own the amount of potentially available cobalt which ought to be processed from the nodules for current consumption, with the remainder stockpiled either for later sale or for host country security reasons, or disposed of as uneconomical tailings.

A third alternative might entail processing and selling the cobalt solely on the basis of producer judgement of overall market demand. To insure developing country protection under this alternative, however, the producers/sellers would have to agree to paying an additional amount into the Authority's revenue sharing trust fund for dispersement to impacted, developing country producers. All mining revenues are already to be taxed at a rate of .75 percent (three-fourths of one percent) of their fair market value, and this rate could be selectively increased for otherwise unrestricted mineral sales which induced an adverse impact on developing country incomes.

The foregoing is not perceived as an exhaustive list, but does, in our judgement, illustrate that clear alternatives to achieving the developing country income protection objective do exist, and appear to pose lesser problems for efficient development of ocean mineral resources than the currently proposed production controls.

Technology Transfer

Assured access to technology that will guarantee the Enterprise and developing countries the capability to mine the deep seabed is a highly controversial aspect of the current draft Law of the Sea Treaty. The mandatory nature of the transfer provision requiring the sale of technology to developing countries has met with severe opposition from U.S. companies. They maintain that the provision is neither in their best interest nor in the national interest. Disagreement on this issue is a major impediment to successful conclusion of the treaty.

Originally proposed by the Secretary of State in 1976 as part of a package designed to win support for the "parallel system", some form of mandatory technology transfer has been integral to seabed mining negotiations ever since.

The parallel system was proposed to assure the developing countries that they would be able to participate in the actual mining of ocean minerals, not simply in a revenue-sharing capacity. Since that time, the developing countries have maintained, and U.S. negotiators have confirmed, that the technology transfer provisions would provide the only assurance that the parallel system could be made workable. They suspect that technology will not otherwise be available to them.

Technology transfer provisions of the draft treaty require that operators make that technology 1/, which they use in mining the deep seabed beyond national jurisdictions and which is legally transferable, available on reasonable commercial terms and conditions to the Enterprise and to developing countries when requested. This agreement may be invoked only if the Enterprise finds that it is unable to obtain adequate technology on the open market on reasonable terms. A further stipulation is that the technology involved is restricted to the actual mining and not to other activities such as processing. Technology transfer obligations remain in effect for ten years from the time that the Enterprise commences its initial commercial operations.

The focus of opposition to technology transfer provisions in the draft treaty is in the following areas:

--It does not protect proprietary technology.

--It does not assure adequate compensation for transferred technology.

--It does not adequately protect defense-sensitive technologies.

Proprietary Technology

Because the draft convention requires that companies agree to transfer all technology they use to the Enterprise or to developing countries, they oppose the provision on the grounds that it will compromise their proprietary information.

A 1978 report 2/ assessed the implications of deep ocean mining technology transfer for the U.S. Bureau of Mines and shed light on this issue. The report cites the minimum of information considered proprietary as mine site data, detailed methodologies for statistically treating mine site data to characterize a mine site, system design, system requirements, computer software for system operation, and mine planning. In addition, there are several new technologies involved, i.e., deep pumping, nodule collecting, nodule processing (or conversion of nodules to normal processing feeds), ship control, and specific hardware (dump valves, collector weighing systems, etc.) for which the industry has products or trade secrets that they consider highly proprietary. The report concluded, however, that this proprietary information is available to any similarly technically competent investor willing to make an

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1/Technology includes the specialized equipment and technical know-how, including designs, operating instructions, training, and technical advice and assistance necessary to assemble, maintain, and operate a viable system.

2/A Preliminary Study of the Consequences of Deep Ocean Mining Technology Transfer, Science Applications, Inc., 1978.

investment of similar magnitude, and noted that proprietary status has only a limited lifetime, normally less than ten years and often of the order of only five or six years.

A subsequent report 1/, also for the Bureau of Mines, found that adequate sources of deep ocean mining technology were available on the open market. Two basic categories of technology were identified as

--component supplier technology which is hardware-intensive and characterized by packaged technology and manufacturing knowledge, and

--system technology which is characterized by a select skilled labor base having knowledge of hardware system design, integration, operation, maintenance, and overall management.

The report concluded that "because of the relatively large number of suppliers of systems and component technology that is available... there is no apparent reason why the Enterprise could not compete quite favorably in the deep ocean mining industry given the proper approach." Thirty-four companies from both developed and developing countries capable of originating system technologies were listed, and sources of supplies for all the component elements were listed.

It must be kept in mind that, as discussed on p. 1 and in chapter 3, many years and hundreds of millions of dollars will be required to develop all the technology necessary for a full-scale commercial mining operation. However, to the extent that deep ocean mining technology has been developed, the findings of these two reports suggest that open market sources of the technology would be adequate to allow the Enterprise to design a deep ocean mining system itself, or to acquire a system from a systems technology contractor. This is consistent with information we developed from discussions with engineers, ocean mining company officials, and others actively involved with these issues.

The likely availability of future technology on the open market is reflected in the increasing number of companies and countries which are either acquiring deep ocean mining technology or getting involved in related research and development. For example:

--The current major ocean mining consortia are all composed of companies from a variety of countries. These four consortia consist of over 20 companies from eight countries.

--Japan has set up an industrial ocean minerals association of 38 countries and is this year

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1/Alternative for Technology Transfer to the Enterprise, Science Applications, Inc., July 1980.

authorizing a $105 million project to develop technology.

--A Norwegian firm actively solicited customers for its technology research and development program during the course of the Spring 1981 session of the Law of the Sea Conference.

--In order to begin mining manganese nodules, India has ordered a research ship from West Germany for nodule surveying, a geo-technical ship from France, and is purchasing a third ship with Danish aid.

--The West German foreign minister signed an agreement in New Delhi giving India a loan worth $72.8 million for deep seabed research.

--A previously cited Bureau of Mines study concluded that "no aspect of deep ocean mining requires unique, unorthodox, or highly innovative ideas to develop. Development is primarily a matter of the competent and efficient utilization of engineering principles."

Fair And Reasonable Commercial Terms And Conditions

Ocean mining companies maintain that their bargaining position for the sale of new technology of uncertain long-term value will be weakened by their obligation to sell. They feel that the massive investments they have put into ocean mining technology will not be reflected under "fair and reasonable commercial terms and conditions."

The draft treaty provides that compensation to the suppliers of technology shall be made on "fair and reasonable commercial terms and conditions." At stake are both technology that has been developed by third party suppliers and sold to ocean mining consortia, and technology developed by the consortia itself. A reasonable price for technology developed by third parties would appear to be easily established based on the price that technology was initially sold to the consortia. The price for technology developed by the consortia itself could prove difficult to establish and the potential for disputes is great. Disputes as to whether offers made by the contractor are within the range of fair and reasonable terms and conditions may be submitted by either party to binding commercial arbitration in accordance with the United Nations Conference on International Trade Law (UNCITRAL) arbitration rules.

In an effort to clarify terms and ultimately minimize the potential for disputes, the United States delegation to the Law of the Sea convention compiled a list of what is generally regarded in commercial transactions as fair and reasonable (See App. II).

Utilization of this type of clarification in efforts to modify the draft treaty, in conjunction with UNCITRAL arbitration procedures, would appear to constitute an effective means of minimizing disputes.

UNCITRAL arbitration rules were designed to facilitate the arbitration of disputes arising out of international trade transactions. A special attribute of the rules is that they were established for worldwide use. They have been found to offer a well-balanced and modern set of arbitration rules prepared by experts from all over the world.

Defense-Sensitive Technologies

The draft negotiating text requires miners to guarantee that they will transfer all technology, not only that which they own but also that of their suppliers, to the enterprise or to developing countries when such is unobtainable on the open market. Opposition to the provision has focused on the possible breach of national security restrictions that it entails because some technologies used in deep ocean mining could be defense-sensitive and subject to export restrictions. The extent to which the Treaty's provisions would run counter to the 1979 Export Administration Act, which controls the export of defense-sensitive technologies, has aroused considerable concern.

A primary objective of U.S. export control legislation is to control exports of goods and technology which could make a significant contribution to the military potential of any other nation or nations when this would prove detrimental to the national security of the United States. On the other hand, these controls are to be applied so as to result in the minimum interference in the normal conduct of commercial trade. Full compliance must be assured with U.S. export regulations pertinent to defense-sensitive technologies which may be used in ocean mining systems.

As already shown, there appear to be plentiful sources of necessary technology on the open market. However, there are those who feel that some technologies, such as equipment for positioning ships over mining sites and bottom profiling equipment, are defense-sensitive.

We believe that protection of U.S. national security interests is provided for by article 302 of the draft treaty which states that "nothing in this convention shall be deemed to require a state party in the fulfillment of its obligations under the relevant provisions of this convention, to supply information the disclosure of which is contrary to the essential interests of its security."

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Given the enormous private investment yet required before seabed mining technology is fully developed, it is imperative that the Law of the Sea Treaty adequately protect that investment. With

appropriate modifications, there appears to be minimal harm associated with mandatory technology requirements of the draft treaty. And, given the very specific objectives of the provision (to assure the viability of the parallel system) and its temporary nature (set to expire ten years from the time the Enterprise commences operations), objections based on its implications as a precedent in international economic negotiations appear unwarranted.

On the contrary, with appropriate modifications, the provisions are consistent with U.S. initiatives in drafting the International Code of Conduct on the Transfer of Technology and other policy statements, such as are included in the 1979 Export Administration Act, in which the United States has concurred with developing countries on the importance of transferring technology to them. One of the Code's many objectives is "to facilitate and increase the flow of proprietary and non-proprietary technology for strengthening the growth of the scientific and technological capabilities of all countries, in particular the developing countries, so as to increase their participation in world production and trade."

Dispute Settlement

Consortia interested in mining the deep seabeds are concerned over the highly complicated structure for settling disputes under the draft treaty, and the potential for bias in the exercise of discretionary authority involving disputes that might arise from the implementation of a parallel system.

It is exceptionally difficult to gauge the possible abuse of international discretionary powers over deep seabed mining operations, particularly since the Preparatory Commission, which will not meet prior to finalization of draft treaty negotiations, will be establishing rules, regulations, and overall operating guidelines. However, protection of the vital interest of countries supporting seabed mining operations has been greatly improved by revised council voting structures and strict adherence to non-political criteria. We believe they would be further improved with modifications such as those recommended in this report.

If parties are unable to resolve disputes, the draft treaty provides recourse to several dispute resolution bodies.

The International Tribunal for the Law of the Sea, which will deal with disputes regarding all parts of the treaty, is to consist of 21 members. Members must have the "highest reputation for fairness and integrity and be of recognized competence in matters relating to the law of the sea." They must also represent the principal legal systems of the world and equitable geographical distribution. To ensure this result, no state can have more than one member on the Tribunal and each geographical area (African, Arabic, Eastern European, Latin American, Western European, and other groups, the last group including the United States) must have at least three members. Members shall be elected by all states with each state having one vote.

Most disputes regarding seabed mining would be handled by the establishment of a Sea-Bed Disputes Chamber, a subset of the Tribunal consisting of 11 members elected by and from among the Tribunal members. While the Chamber would have no general jurisdiction over the Authority, it would have jurisdiction in disputes between the Authority and any nation over alleged treaty violations.

To deal with particular disputes, an ad hoc chamber of the Sea-Bed Disputes Chamber consisting of 3 members can be formed. One is appointed by each party in the dispute, and the third is to be selected by the two parties or, if they cannot agree, by the President of the Chamber. Members of this chamber cannot be nationals of or in the service of any of the parties to the dispute, nor can they be totally biased against one party.

Disputes may also be resolved through binding arbitration, but if the dispute involves a question of interpretation of the treaty, then this question must be resolved by the Sea-Bed Disputes Chamber before the arbitration panel may proceed. The applicable law in these disputes will be the treaty and other compatible rules of international law.

Mining industry officials believe that the composition of the Sea-Bed Disputes Chamber will be unfavorable and prejudicial to their interests, and that disputes brought before this body may not be fairly resolved. They are also concerned with the limitations on the jurisdiction of the Chamber and about the absence of an appellate body with jurisdiction to review actions of the Authority. They state that the strict circumscribing of judicial review in these matters would raise obvious problems for industrialized nations' miners when one examines the extent of discretion and implied powers that would be granted the Authority and its subsidiary organs.

A former U.S. participant in the treaty negotiations told us that the treaty language dealing with the Sea-Bed Disputes Chamber was "necessarily ambiguous" in order to get agreement on leaving it in the treaty. How the Chamber will actually operate will require interpretation of the treaty provision. The U.S. interpretation is that while the Chamber cannot overrule the Seabed Authority or question its rules and regulations, it can rule on whether the Authority has overstepped or abused its powers.

CHAPTER 3
CAPITAL AVAILABILITY AND TECHNOLOGY DEVELOPMENT

A stated congressional purpose in passing the 1980 deep seabed mining act was to "encourage the continued development of technology necessary to recover the hard mineral resources of the deep seabed." Recognizing that it would take years for final ratification of the Law of the Sea Treaty, the Congress felt it important that technology development continue during the interim period.

We found that investment in technology development has practically come to a standstill. According to consortia officials, the 1980 Act does not offer them much incentive to continue investment because the Law of the Sea Treaty is looking over its shoulder and, when ratified, will supersede the Act.

It is currently estimated that the mining consortium will need over $1 billion to develop the technology, purchase the hardware, and set up and begin a deep seabed mining operation. The availability of commercial financing to underwrite these ventures is critical to the future of deep seabed mining.

The mining consortia say they are unwilling to make further investment until they have assurance that their investments will be protected. We also met with representatives of many major banks that have had some involvement with seabed mining ventures. The bank officials say that financing will not be available until the draft treaty is agreed to, and that the treaty itself needs numerous changes.

STATUS OF CONSORTIA INVESTMENT

The consortia have reduced the amount that they have been spending on the preliminary steps to seabed mining. Consortia officials estimate that ocean mining budgets have been slashed by 75 percent. For example, one consortium has cut its expenditures from approximately $25 million a year to $5 million; another, which has spent $50 million total, has cut expenditures to zero. The consortia estimate that the prototype equipment development stage will cost between $80 million and $250 million for each consortium. Consortia officials said that the prototype stage will not take place until the ambiguities in the treaty are eliminated and it is ratified. They generally agree that a treaty is essential for future financing and fullscale investment by the consortia.

The prototype stage of investment is considered to be developmental and will be totally equity financed according to consortia officials. Costs for commercial development, however, will be partially equity-financed and the rest project-financed. All possible sources of funds will be considered, including bonds, banks, and the World Bank (for any developing nations that may enter seabed mining).

ADEQUATE COMMERCIAL FINANCING DEPENDS ON TREATY MODIFICATIONS

Bank officials believe that the 1980 Act and pending treaty contain provisions which will impede the financing of these ventures. Changes will have to be made to the current treaty text for financing to occur. Banks require an operating environment where mine site tenure is guaranteed and where mining is not subject to arbitrary influence from political entities. They believe that neither the current treaty text nor the 1980 Act provide these assurances. Several of the bankers we spoke with clearly indicated that, unless changes are made to the treaty, financing will not occur.

Deep seabed mining projects entail capital expenditures beyond the means of individual mining companies to finance from retained earnings, depreciation, and depletion. Consequently, the formation of joint ventures and reliance on commercial financing have increased. One form of financing being considered by the mining consortia is project financing which consists of raising capital solely on the assets and future cash flows of the project for debt repayment. The source of repayment is not expected to come from the general funds of the sponsoring company itself. The main attraction of project financing is the ability to pass certain risks to the lenders.

To meet the need for external financing, commercial banks and other financial institutions have established "acceptable risk" criteria for mineral industry financing. Before financial institutions will consider participating in such a venture, it will have to withstand a critical evaluation of certain risk factors.

Particular provisions of the current treaty text and the 1980 Act will make it difficult for banks to finance these projects. These provisions produce risks which bankers are not willing to assume. Based on our discussions with bank officials, there are three particular risks posed by these provisions--political risks, production risks, and market risks. Political risk is the risk that government authorities will impose restrictions, regulations, or levies which will hurt the project's cash flow and ability to service debt. According to bank officials, there are provisions within both the Act and draft treaty which magnify political risks associated with deep seabed mining.

As mentioned previously, the National Oceanic and Atmospheric Administration (NOAA) is authorized to negotiate a "reciprocating states' agreement" with those nations capable of mining the deep seabed. There are eight nations that NOAA is negotiating with to form a reciprocating states' agreement. Reciprocating states are foreign nations which, among other things, provide

> "an internal legal framework for exploration and commercial recovery which does not unreasonably

interfere with the interest of other States in their exercise of the freedoms of the high seas, as recognized under general principles of international law."

Bankers do not consider the Act as providing adequate protection if a nonreciprocating state should encroach upon an established mine site. Some bank officials believe that, because all nations will not be part of a Reciprocating States' Agreement, there may be a question whether ventures have clear title to minerals recovered.

Bank officials believe these provisions add uncertainty to the security of tenure, access to the minerals, and the overall operating environment. Officials reported that deep seabed minerals ventures are extremely capital-intensive and result in very protracted periods of paybacks. To mitigate bankers' risks, they need evidence that the project will have clear cut access to the area to be mined.

Production risk is essentially the uncertainty whether the project will continue to be capable of producing projected volumes of salable product at predictable costs over the life of the project's debt financing. Production risk is also known as operating risk. It has two interrelated components--technical risk (relating to technology and experience of staff) and economic risk (relating to cash flow analysis for determining whether project revenues will cover project costs). We found that there were various provisions within both the 1980 Act and the treaty which increase the production risks associated with these projects.

Several provisions within the treaty were cited by banking officials as adversely affecting production risk, particularly production controls which could affect a project's cash flow and its ability to repay financing. Officials at several banks also believed these controls exacerbated the political risks associated with the treaty, because the limits will be set by a political entity--the 36-nation Council. Bank officials believed that the treaty would allow the Council through production controls to affect the price at which the recovered minerals can be sold, which in turn could reduce the project's cash flow.

Officials at another bank believe there is technological uncertainty with regard to these projects. They said that recovery technology on a long-run basis has not proven that it can recover the nodules. The transfer of technology provision of the treaty was considered by some banking officials as being a serious problem. They believe this provision is a disincentive both to the banks and the consortia, because it will result in the loss of a competitive edge. In addition, they believe the definition of the technology to be transferred and of the developing (recipient) countries is vague and could lead to abuse. The requirement will also burden the consortia to educate recipients as to the

technology. One bank official pointed out that political risks cannot be separated from economic consequences. He said adverse decisions by political entities always affect the economics of a venture.

Market risk is the uncertainty that, with production at anticipated volumes, there will be sufficient revenue to cover operating expenses and debt service over the life of the project's debt financing. Market risk is amplified when tonnage cannot be sold, production declines, or the product sale price falls. Banking officials stated that production controls within the treaty will affect market risk and the project's cash flow generation as well as inhibit bank financing.

CHAPTER 4
CONSERVATION OF SEABED MINERAL RESOURCES MUST BE ASSURED

The availability of manganese and cobalt are of foremost concern to the Congress, because the United States has no significant domestic production of either mineral and because future sources of supply are considered problematic.

In the case of manganese, few countries have reserves, and projections are that by the year 2000 the United States could be entirely dependent on South Africa for its total requirements. The problem was recognized in congressional deliberations on the 1980 deep seabed mining act. Congress found the manganese situation to be severe--"conditions exist in the world metal markets that indicate...a significant possibility of short-term...supply interruptions." Seabed mining was deemed to be in the national interest as one means of decreasing potential supply constraints.

Of the four ocean mining consortia with U.S. participation, only one definitely plans to produce manganese from the nodules. The other miners believe manganese production may not be profitable. What the consortia do not produce becomes process waste and must be discarded. If disposal consists of ocean dumping, the resource will be lost forever. Even if the waste is retained on land, the manganese may never be economically recoverable.

Over 90 percent of manganese is used in the production of steel and there is no known acceptable substitute for it in steel making. It is generally held that manganese consumption is directly proportional to steel production, illustrated by the fact that the U.S. with about 16 percent of the world's steel production capacity uses about 16 percent of the world's manganese. The United States consumed about 1.2 million tons of manganese in 1980, off somewhat from prior years because of a decline in U.S. steel production. The Bureau of Mines estimates that by the year 2000, U.S. consumption will nearly double to about 2.1 million tons.

The National Materials Advisory Board of the National Academy of Sciences issued a report 1/ on manganese in July of 1981. It concluded that even though the world manganese reserves are adequate until the year 2000, their availability to the U.S. may be increasingly strained or subjected to disruption. One cause is that communist bloc countries will continue to expand their purchases in the free-world market; another is the small number of manganese suppliers in the free-world market. The report recommended implementing a national materials policy which would recognize U.S. dependence problems, with consideration to development of new sources of supply, such as deep seabed nodules.

1/"Manganese Reserves and Resources of the World and Their Industrial Implications," National Materials Advisory Board, National Academy of Sciences, NMAB-374, 1981.

Because of its importance and U.S. import dependency, manganese is designated as a strategic and critical material and included in the National Strategic and Critical Materials Stockpile. In March 1981, the stockpile contained about 3.5 million tons of stockpile grade manganese in its various forms, enough to meet U.S. needs for 3 years.

PLANNED DISPOSITION OF SEABED MINERALS

The manganese nodules contain about 20 to 30 different minerals, many in only trace amounts. Of the four key minerals, manganese is by far the largest component. The percentage varies among samples, but the prime mining area in the Pacific Ocean contains nodules with 25 to 35 percent manganese content. Nodules also contain iron which, when combined with manganese, becomes ferromanganese, the primary form of manganese used for steel production.

The one U.S. ocean mining consortium that plans to produce manganese (in the form of ferromanganese) believes its product will be economically competitive with the ferromanganese produced from land deposits. The other three consortia have not reached that conclusion. They believe the current manganese market value is not high enough to make manganese profitable. The reason for this disparity is that a variety of metallurgical processes is available, and the consortia have proceeded in different directions. The one definite manganese producer claims to have an integrated process (one in which a single process yields more than one product) that the others do not have. The others state that they are keeping all options open, and if they later determine nodule manganese to be economically producible they could enter the market.

The consortia are planning on different mining rates, which are not fixed yet, but the most commonly discussed range is 2 to 3 million tons of nodules per year. Assuming the four U.S. consortia each mine nodules at a rate of 2 million tons per year, total ferromanganese production could be about 2.4 million tons per year (at a nodule content of 30 percent manganese), or nearly double the total U.S. consumption in 1980. Obviously, U.S. manganese demand could be fully met by just a few ocean mining ventures. If production would exceed demand, the United States could become a net exporter.

Such a sizable new supply in the world market might well have a depressing effect on manganese prices. The National Materials Advisory Board's findings, however, show a decline in developing countries' landbased manganese reserves, and point to the possibility of higher prices. Predicting the economics of manganese production from nodules is highly speculative at this time.

Manganese is not the only nodule component that may be neglected. Of the 20 to 30 unproduced components, most are in

extremely small proportions. Many are also designated strategic materials and included in the U.S. strategic stockpile. They would also not be produced for economic reasons, i.e., the production cost would be higher than the competitive value.

The following table shows a sample nodule assay from the primary mining area in the Pacific Ocean. It also shows which components are included in the stockpile.

Table 2 1/

Sample Pacific Nodule Mineral Composition

Component	Percent
Nickel	1.5*
Copper	1.3*
Cobalt	.2*
Manganese	33.4*
Iron	6.1
Silicon	6.5
Aluminum	2.4*
Sodium	2.2
Calcium	1.7
Magnesium	2.1
Other (19)	3.2

*In Strategic Stockpile

Any of the nodule components that are not deemed economical to produce must be disposed of as waste. Waste disposal is a major problem for any mining industry. For nodule processing, only about 3 percent of the contents would be produced in cobalt, copper, and nickel, leaving a large quantity of waste materials. Storage on land would require large amounts of land. The quantity alone may cause the ocean miners to seek to dispose of the waste in the ocean. Once the waste is dumped in the ocean, it becomes virtually unrecoverable because it would disperse into the seabed. Even if the waste is retained on land, its form may present difficulty in reprocessing to recover its contents. Even if technologically possible, the cost may make such reprocessing uneconomical.

POSSIBLE GOVERNMENT ACTION NEEDED TO CONSERVE SEABED MINERALS

Although manganese and other components of nodules may be neglected by ocean mining enterprises for economic reasons, such

1/V. E. McKelvey, et al, "Manganese Nodule Resources in the Northeastern Equitorial Pacific," Marine Science, vol. 9, 1979.

business interests may not coincide with national interests. Some of those minerals, including manganese, are designated U.S. strategic and critical materials and included in the National Defense Stockpile.

Under the 1980 deep seabed mining act, NOAA has regulatory responsibility for the ocean mining industry and is aware of the potential problems related to manganese conservation. In its Draft Programmatic Environmental Impact Statement for Deep Seabed Mining, dated March 1981, NOAA recognized three alternatives:

--Let the market decide. The market would be the sole criterion in determining the fate of the manganese.

--Require four-metal operations. This could delay mining until the manganese market opens up or the Federal government becomes financially involved.

--Establish a means for manganese to be saved as a resource for the future.

That document selects the third as the best alternative and says "retention...could be assured if...saved at government expense for the National Defense Stockpile." NOAA plans additional study of the problem.

Federal inaction would treat the problem as strictly a matter of economics with Federal intervention in a free enterprise economy being undesirable. The resource would be viewed as belonging to business and its owner would market or ignore it as befits a profit-making enterprise, with the assumption that if the manganese supply situation becomes bad enough the price will rise and the ocean miners will have economic justification to market the resources.

Obviously, such Federal inaction would not assure prudent resource conservation. If manganese disposal is allowed, there are a number of potential problems which could adversely affect future availability. First, any change in the economics of producing manganese may occur too rapidly to allow enough lead-time to convert processing capacity to meet the need. Related to this is the possibility that plants set up to process only the other three minerals may not be conducive to conversion, making construction of new plants necessary. Those not processing manganese may not have done the necessary research and development to have the knowledge to succeed at the new process. Second, if any significant gap occurs between the start of ocean mining and the change in economic conditions, deposits with high concentrations of manganese would have been used and, if not stored on land, would be permanently lost. Third, if the change in economics occurs because of an emergency, such as in a war, the nodules may not be accessible. With mining occurring in the high seas, operations could easily be disrupted.

Although the United States has been stockpiling materials under the Strategic and Critical Materials Stockpiling Act, its purpose has been to fill shortages in normal markets during a national emergency; this precludes unlimited acquisition of materials beyond the stockpile goals. However, another purpose of the stockpile is to "encourage the conservation and development of sources of (strategic and critical) materials within the United States."

The National Materials and Minerals Policy, Research and Development Act of 1980 requires the Department of Commerce to assess the option of economic stockpiles as a means of assuring that material requirements can be met. If manganese is left in the process waste and those miners do not opt to retain the waste at their own expense, the Government could obtain the manganese for an economic stockpile at minimal cost. However, industry officials told GAO that reprocessing the wastes in a separate process after the other three metals had already been extracted would not be economically feasible due to the large amount of waste in proportion to the remaining small metal content.

Alternative uses for manganese in the metals industries are receiving increased attention. The Bureau of Mines has contracted with the Massachusetts Institute of Technology to identify new markets for manganese which might be derived from deep seabed mining. Further Federal support of research and development into enhanced manganese usage is seen as beneficial not only from the standpoint of oversupply in the manganese market, but as a potential substitute for other critical alloying metals, such as chromium, upon which the United States is highly import-dependent.

This discussion of conservation issues pertains to the current status of treaty negotiations. Other issues may arise in conjunction with potential alternatives to presently proposed production controls as discussed in chapter 2. Conservation aspects, therefore, will require attention and monitoring as treaty negotiations progress.

CHAPTER 5
ENVIRONMENTAL ASPECTS OF SEABED MINING

The Deep Seabed Hard Minerals Resources Act of 1980 has established a program whereby potential environmental impacts caused by seabed mining are being addressed prior to their becoming impediments to exploration and development. Continuing studies will be necessary to assure that evolving mining and processing technologies do not cause currently unforeseen impacts.

NOAA IS RESPONSIBLE FOR DETERMINING AND REGULATING ENVIRONMENTAL IMPACTS

In 1978, 1/ we reported that a major problem impeding deep ocean mining was the need to identify and regulate environmental impacts. The report indicated that resolving the environmental problem was necessary so industry could develop environmentally acceptable mining and refining technologies. Subsequent to that report, the Congress implemented the 1980 deep seabed mining act. One of the five major purposes of the Act is:

> "to accelerate the program of environmental assessment of exploration for and commercial recovery of hard mineral resources of the deep seabed and assure that such exploration and recovery activities are conducted in a manner which will encourage the conservation of such resources, protect the quality of the environment, and promote the safety of life and property at sea..."

To assure the provisions of the Act are implemented, the Congress designated NOAA as the agency responsible for issuing exploration licenses and recovery permits to U.S. citizens. NOAA is also responsible for publishing regulations for implementing the deep seabed mining program while assuring the marine environment is protected from the effects of exploration activities. Specific responsibilities given to NOAA under the 1980 Act for safeguarding environmental quality are shown in Appendix III.

NOAA IS FULFILLING ENVIRONMENTAL REQUIREMENTS OF THE ACT

Thus far, NOAA has complied with its requirements, within the established timeframes, and has produced several significant documents, two of which were specifically required by the Act. In November 1980, NOAA prepared a draft Five-year Marine Environmental Research Plan (1981-1985) for Deep Seabed Mining and Processing Waste Disposal. In March 1981, NOAA issued draft deep seabed mining regulations and a draft programmatic environmental impact statement (PEIS), both of which have since been finalized.

1/"Deep Ocean Mining--Actions Needed to Make it Happen," PSAD-77-127, June 21, 1978.

NOAA's PEIS identifies, as discussed below, the principal potential at-sea impacts on the environment as those associated with mining activities, at-sea processing, and transportation to port. The disposal of processing wastes on-shore, or the ocean dumping of on-shore generated processing wastes, is a separate topic and is covered in another section.

Environmental Impacts Associated with Mining Activities

Hydraulic mining systems, which are favored by several of the commercial mining consortia, are expected to result in both surface and subsurface adverse environmental impacts.

Hydraulic systems use large collectors, up to 66 feet in width, which are pulled or driven along the seabed. NOAA indicates that collector action and the sediment disturbance next to the collector track will probably cause unavoidable destruction of benthic biota (sea stars, sea urchins, polychaete worms, and sea anemones).

NOAA states in its PEIS that the effect of the disturbance will depend on the kinds of equipment used and intensity of mining. They claim none of the affected biota are mammals, vertebrates, amphibians or other higher forms of life. NOAA is not aware of any benthic endangered species inhabiting the area that may be affected by bottom disturbance. NOAA's worst case impact estimate stemming from its Deep Ocean Mining Environmental Study (DOMES) program is that the benthic biota in or adjacent to the collector track, in about one percent of the area studied, may be killed due to first-generation mining activities.

Another impact may be caused by a benthic sediment plume or "rain of fines" which will affect biota beyond the direct contact zone. This plume can extend tens of kilometers from the collector and last several weeks after mining ceases and can cause smothering and interference with bottom feeding of small seabed bottom animals. This "rain of fines" may have the potential for adversely impacting the biota in an estimated additional 0.5 percent of the DOMES area.

NOAA has based its knowledge of potential environmental impacts, as specified in its PEIS, on brief periods of pilot scale mining. Therefore, NOAA intends to verify or update conclusions in the PEIS by requiring monitoring of the demonstration scale mining tests to be conducted by mining firms during the licensing phase.

NOAA's PEIS summarizes potential biological impacts related to mining activities, and indicates research projects NOAA proposes for evaluating possible mitigation strategies.

Environmental Impacts Associated with At-Sea Nodule Processing

At-sea processing of manganese nodules implies refining nodules and disposing of wastes at sea rather than on land. NOAA's Deep Seabed Mining PEIS states the potential impacts of at-sea processing are not yet known, but its 5-year research plan addresses the issue with planned research projects.

A recent study funded by NOAA determined that full or partial at-sea processing of manganese nodules would probably not be implemented during the industry's first generation. NOAA's 5-year research plan states that industry has confirmed this finding. The research plan explains that complete at-sea processing would require the development of new technologies in metal separation and reduction which are thought to be beyond the state-of-the-art. Similarly, the economics of partial processing, which removes much of the waste material from the nodules, as an alternative to complete at-sea processing needs further study. Either full or partial at-sea processing would eliminate the generation of the solid portion of processing wastes onshore and reduce the size of the onshore plant.

NOAA's Deep Seabed Mining PEIS states that should at-sea processing be proposed a supplemental PEIS will be prepared to discuss the specific impacts.

Environmental Impacts Associated With Transportation of Nodules to Port

The third principal potential at-sea environmental impact involves transporting the manganese nodules from the mining ship to ore carriers and then to port.

In 1977, NOAA contracted for a study of manganese nodule transportation and waste disposal systems. The report indicates nodules may be moved from mining ships to ore carriers by slurry pumping, mechanical conveying, or by pneumatic blowing. The report states that slurry methods are most promising and are under consideration by all mining consortia.

NOAA's Deep Seabed Mining PEIS considers the possibility that, during nodule transfer from mining vessel to ore carrier in a seawater slurry, discharges of seawater and accidental discharges of nodules are possible. The PEIS asserts that seawater discharges from nodule transfer are unlikely to add significantly to discharge associated with nodule recovery. If the nodules themselves are inadvertently dumped, the PEIS states that a significant impact is not expected because the nodules appear to be inert in their natural form.

The PEIS assumes that an average of one ore carrier ship per day will travel between port and each mine site during first generation mining. NOAA has determined that this level of vessel

traffic should not significantly affect the environment, but claims that this issue will be addressed in site-specific environmental impact statements.

The ore carriers can be used to carry personnel, fuel, and supplies to the mining ship on return trips from the processing plant; consequently, there is a possibility that fuel spills could occur. NOAA believes that possible oil spills from the ore carriers are not significant because cargo oil holds are less vulnerable than tanker hulls, and only small volumes of oil are involved.

Bulk-carrying ships, such as ore carriers, especially U.S.-built ships carrying the U.S. flag, are subject to extensive safety and pollution control regulations administered by the Coast Guard, the American Bureau of Shipping, the Environmental Protection Agency, and the Intergovernmental Maritime Consultative Organization. NOAA believes potential seabed mining countries generally have safety requirements comparable to the United States, but environmental laws which are less strict. NOAA asserts that problems, if any, are more likely to arise with "flag of convenience" countries. These countries frequently have a poor record of enforcement. While enforcement against foreign flag ships used in conjunction with U.S. licenses or permits may be difficult, NOAA can act against the licensee or prohibit their use of U.S. ports.

Processing Waste Disposal is a Major Environmental Consideration

In addition to at-sea environmental impacts, the disposal of wastes generated by onshore processing creates additional impacts which must be dealt with. It is difficult to determine the extent of environmental impacts which may be caused by manganese nodule processing wastes, because neither commercial scale nodule recovery nor nodule processing have yet been demonstrated. In addition, neither specific processing sites nor specific technologies have been identified.

NOAA has sponsored studies of various technologies which might be used for nodule processing and studies of geographic areas of the United States where processing plants might be located. NOAA found that although the metallurgical processes to be used in processing nodules are different from those used in processing land ores, the facilities and techniques are similar. The most significant differences between land ore and nodule facilities are the make-up of the ore and the probability that more populated coastal locations will be considered for nodule processing plants.

From an environmental standpoint, the disposal of processing wastes will be one of the greatest concerns faced by the mining companies in extracting valuable metals from manganese nodules. NOAA considers the large quantities and the unknown chemical and physical characteristics as two of the major concerns in disposing of the wastes.

Over its operating life, a three-metal plant 1/ would generate about 3.3 to 4.4 million tons of waste per year which, in total, would cover an area of 2,000 acres to a depth of about 40 feet. A four-metal plant 2/ would generate annually 0.55 to 0.82 million tons of waste or, in total, cover an area of 400 acres to a depth of about 40 feet.

The 1977 study prepared for NOAA examined six waste disposal systems mentioned for potential use in the industry. Among the possible alternatives were three land fill techniques, a slurry evaporative technique, storage of waste as a manganese reserve for future processing, and ocean dumping. The study described the slurry waste disposal form as being the most common way of disposing of tailings.

SOME CONCERNS ABOUT MANGANESE NODULE MINING AND PROCESSING VOICED BY ENVIRONMENTAL ORGANIZATIONS

Environmental organizations have shown interest in deepsea mining because of its potential for adverse environmental impacts. A number of these organizations have been represented by the Center for Law and Social Policy (CLSP), a Washington, D.C., based non-profit public interest law firm.

Many of the earlier mentioned potential environmental impacts associated with deepsea mining--impacts on the bottom dwelling benthos, impacts on organisms in the water column and on the surface, and processing impacts--are also concerns of the CLSP. However, the environmental organizations, through the CLSP, indicate that much more research is required to determine the true nature of the impacts, and they favor strong United States support of the Law of the Sea Convention because they believe an international regulatory regime is needed to provide a framework for protecting the marine environment.

Attorneys for the CLSP have been working on behalf of environmental organizations on Law of the Sea issues for about the last 7 years, and we were told that CLSP attorneys had input into and supported the Deep Seabed Hard Minerals Resources Act of 1980. However, the CLSP is a strong advocate for the Law of the Sea Convention, and their attorneys are of the opinion that the United States cannot unilaterally expect to protect the environment, but must cooperate with other nations in developing a sound regulatory framework for deep seabed mining. In a letter to the U.S. Secretary of State, the CLSP explains how an approved Law of the Sea Convention can reduce environmental concerns:

1/One which processes nickel, cobalt, and copper.

2/One which also processes manganese, which is far more abundant than the other three primary metals, thereby greatly reducing the amount of waste.

"From the perspective of environmental concerns, the Convention sets the groundwork for a comprehensive system of protection. A viable framework for the protection of the marine environment is greatly enhanced through such an international regulatory scheme. While the environmental provisions are not perfect, in general we believe they constitute a significant advance over what customary international law now provides, and that the international consensus reflected in the document will lead to sound strategies and solutions in the future. As for deepsea mining, we believe an international regime provides the only mechanism for achieving eventual protection goals and such concepts as protected areas of the open ocean where no commercial activities take place."

* * * * *

It is not yet clear exactly how significant some of the probable environmental impacts from deep seabed mining will be. However, judging from research work already completed, it is not likely environmental impacts will be a major impediment to deep seabed mining.

NOAA is required to complete a site specific environmental impact statement for each license or permit application, and the Federal Government has a number of environmental protection laws which should adequately protect the environment. With these protections already in place, and with additional planned research completed, environmental impacts related to ocean mining should be minimized.

Environmental groups as well as some NOAA officials are questioning whether NOAA's Office of Ocean Minerals and Energy (OOME) will be satisfactorily funded to carry out its regulatory and environmental research functions. For fiscal year 1981, the Congress did not appropriate the money requested by the program. Consequently, OOME has only 15 full-time permanent employees and is depending on another 12 detailees and temporary positions supplied by NOAA. Congressional support or non-support of the program should become apparent at the beginning of fiscal year 1982 when Congress determines the program's appropriation.

A NOAA official told us NOAA is considering the possibility of having the mining companies take responsibility for conducting or contracting research work that is included in NOAA's 5-year research plan, with NOAA's approval of the results. This action would place the bulk of the research expense with industry and reduce NOAA's budget requirements.

CHAPTER 6
CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

The United States relies heavily on foreign sources for many minerals critical to our economy and national defense. Reducing supply vulnerability that may be associated with import dependency is an important national goal. By enacting the Deep Seabed Hard Mineral Resources Act of 1980, the Congress intended to help achieve the goal of lessened vulnerability by prompting development of deep seabed mineral resources.

Full implementation of the 1980 Act is inextricably tied to the status of the Law of the Sea Treaty negotiations. The first stated objective of the Act is to encourage successful conclusion of the treaty. The Act also provides for continued seabed mining technology development and actual mining operations pending conclusion of the treaty.

The status of the treaty, and, therefore, full implementation of the Act, presently are quite uncertain. We believe that the goals of the 1980 Act are important and worth striving for and that the Nation's interests regarding augmentation of reliable mineral supply sources can best be served if it is a party to a comprehensive Law of the Sea Treaty, but only an amended treaty that properly addresses U.S. interests.

In the absence of an acceptable treaty under which the United States might be involved in deep ocean mining, other options might be available. Some form of a reciprocating states alternative, an interim framework provided for in the 1980 Act and already being examined, might eventually be considered an option to the treaty and be extended beyond its originally intended scope.

Conclusions Regarding the Law of the Sea Treaty

Opposition to the draft Law of the Sea Treaty has principally been focused on provisions that would affect access to mine sites, interim investment protection, long-term investment protection, production limits, technology transfer, and the settlement of disputes.

Treaty Offers Reasonable Assurance of Access to Mine Sites

The Deep Seabed Hard Mineral Resources Act of 1980 stipulates that any international agreement to which the United States becomes a party should provide assured and nondiscriminatory access, under reasonable terms and conditions, to the mineral resources of the deep seabed.

Opposition to the provisions of the draft treaty stem primarily from (1) the view that U.S. firms are not guaranteed access to mine sites, and (2) the opinion that, under the parallel system, even the unreserved site might not be available to the mining companies.

Since "Eastern (Socialist) European" nations are guaranteed at least three seats on the Council, a guaranteed U.S. seat on the Council is seen by some as a necessity in protecting U.S. interests. However, others believe that the presence on the Council, which is guaranteed, of nations with similar interests to the United States can adequately protect U.S. interests.

We believe that further definition of criteria to be used by Legal and Technical Commission members (to be established in Preparatory Commission meetings), combined with strict application of non-political criteria by Legal and Technical Commission members in evaluating applications, would provide adequate assurance of access for U.S. firms. We believe this would satisfy the requirements of section 201 of the Deep Seabed Hard Mineral Resources Act of 1980.

Long-Term Investment Protection is Needed

The draft law of the sea treaty provides for review conferences to take place 15 years after the time commercial production begins. Strong opposition to the review conferences stems from the possibility that rules governing mining operations could be dramatically altered in an arbitrary manner. Private companies' ability to obtain commercial financing for mining ventures is adversely affected by potential review conference decisionmaking which could limit private mining companies to first generation mining during which costs are projected to exceed income.

Reasonable assurance that ocean mining companies will not be prevented from obtaining a fair return on their investment must be provided for. As it now stands, review conference proceedings could culminate in dramatically changed conditions for access to mine sites subsequent to first generation mining. The parallel system could be abolished and the private mining companies' access thereby severely restricted.

Basic changes in the parallel system which might affect the ability of companies to gain access to and mine the deep seabeds must be prevented. This could be done either by (1) restricting the procedures in which the assembly might change the mining system, either requiring a concensus in the assembly or providing that the assembly cannot bring about changes without Council concurrence, or (2) seeking limits to review conference authority to changes that do not alter the basic operational structure under which mining is currently taking place.

Interim Investment Protection Remains to be Negotiated

A major declaration of congressional intent, regarding any international agreement to which the United States becomes a party, is that the agreement protect those interim investments made by private companies which have undertaken exploration or commercial recovery prior to entry into force of an international agreement.

Draft treaty provisions do not provide that protection. Mining companies cite the absence of any kind of assurance that they will be able to mine on those sites in which they have invested as a major reason for the marked decline in seabed mining technology development.

Negotiations on protecting investments made prior to passage of an international treaty were scheduled for the Spring of 1980 United Nations' conference session, but were deferred pending total treaty review by the United States. These negotiations must be pursued with first rights to mining sites provided for those who have invested in them and explored them.

Production Controls Threaten Mining Economics

Limits have been placed on the production of minerals from ocean mining ventures to protect developing country land-based producers from adverse impacts on their export earnings. The controls are keyed to the amount of nickel that can be produced, and all other ocean minerals' production limits are based on nickel production. Land-based producers, such as Zaire, of nodule-type minerals often depend heavily on a single commodity (i.e., cobalt) for export revenue--and this source of revenue could be affected by seabed mining.

The production controls proposed in the draft Law of the Sea Treaty have elicited severe opposition because their existence threatens the economic viability of deep ocean mining. Whether this would in fact be the case is unknown at this time due to uncertainties of market prices, demands, and numbers of mines that will actually be operating.

Current projections are that of the four principal minerals to be mined from the ocean, only cobalt is likely to have significant impact on the economies of developing country land-based producers.

With projections of growth in demand for nickel and the anticipation of high cost expansion of nickel production on land, we believe it is imperative that other options be considered for protecting developing country interests, alternatives which would not threaten the economics of deep ocean mining. As discussed on pp. 22 and 23, we believe that such alternatives are available and should be considered.

Technology Transfer Provisions Should be Modified

The draft Law of the Sea Treaty calls for the mandatory transfer of technology to the enterprise or to developing countries in the event that the technology is not available on the open market.

The mandatory technology transfer provision is an integral part of the "parallel system" whereby developing countries are guaranteed access to technology needed to mine the deep seabeds. Major opposition to this provision centers on concerns having to do with proprietary information, fair and reasonable compensation, and defense sensitive technologies. Some of the concern over these issues appears overstated in the context of demonstrated and increasing availability of relevant technologies on the open market. Additionally, protection of defense sensitive technologies is provided for in article 302 of the text which limits the application of the provision in any instance in which the security of a national party is jeopardized.

Ocean mining consortia maintain that private venders of technology will not make their technology available to the consortia under conditions requiring they also make it available to the enterprise and third world countries. The lack of any protection for proprietary data or control over its use, is central to industry's concern. The absence of any accountability on the part of potential recipients of proprietary technology is a fundamental shortcoming of treaty technology transfer provisions.

Technology transfer provisions of the treaty can be markedly improved by assuring that remuneration for transferred technology be made at a level equivalent to compensation paid by the consortia to outside suppliers of technology, and that recipients of proprietary technology under provisions of the treaty are held accountable. Compensation for technology owned and developed by the consortia is subject to negotiation. In the event of a dispute over compensation to be paid to the consortia by the authority or developing countries, the adequacy of compensation should be determined by submission to United Nations Conference on International Trade Law arbitration as now provided for in the text.

Areas of Potential Dispute Must be Minimized

The overall vagueness of provisions of the draft treaty, and potential for abuse of power by the Authority have been of major concern to those involved with ocean policy formulation in the United States.

It is extremely difficult to gauge the validity of concerns about potential arbitrary use of discretionary powers of the

Authority. It is critical, at this time, prior to Preparatory Commission meetings, that areas of potential dispute be minimized. We believe dispute limitation can, to a very large extent, be achieved by treaty modifications as have been suggested.

These modifications, in concert with new voting arrangements in the Council, the strict adherence to non-political criteria in the Legal and Technical Commission as the draft treaty calls for, and, clarification of operating procedures to be taken up in Preparatory Commission meetings, all will work to minimize the need to resort to dispute settlement procedures for concerns vital to ocean mining ventures.

Conclusions Concerning Mineral Conservation

Since only one of the four major ocean mining consortia plans to use the manganese from the nodules, there is potential for discarding enormous amounts of this strategic mineral in a non-recoverable form. This would be contrary to congressional intent as stated in the 1980 deep seabed mining act. And, since manganese is a designated strategic and critical mineral, its waste would be contrary to the Strategic and Critical Minerals Stockpiling Act.

We believe that many of the Federal agencies having some responsibility for these matters are unaware of the potential for wasting manganese and other minerals.

On the assumption that the United States proceeds with its involvement in the Law of the Sea Treaty process, we feel that the Congress needs to evaluate current industry plans with respect to the mining and disposition of all four principal nodule minerals. If it is determined that those mining plans, which, as now formulated, call for disposal of manganese, are not consistent with the intent of the 1980 Deep Seabed Hard Mineral Resources Act, the Congress should consider amending the legislation to assure the conservation of such strategic and critical minerals as manganese. Options should be weighed on the most efficient way to achieve conservation goals, the amounts of the minerals that might be stored, and who will bear the burden of conservation costs. And, efforts to continue or increase Federal research and development into new markets for manganese, such as that now underway at the Bureau of Mines, should be evaluated.

This discussion of conservation issues pertains to the current status of treaty negotiations. Other issues may arise in conjunction with potential alternatives to presently proposed production controls. Conservation aspects, therefore, will require attention and monitoring as treaty negotiations progress.

Conclusions Concerning Environmental Protection

To the extent that seabed mining has progressed, we believe that the provisions of the 1980 deep seabed mining act dealing

with environmental protection have been successfully implemented by the National Oceanic and Atmospheric Administration.

NOAA will have increased responsibilities in the future. Consequently, it is necessary for NOAA directly and in conjunction with future mining activities to continue studies currently underway, and to monitor future seabed activities as certain of the potential environmental impacts will only be understood on the basis of evaluations of actual commercial-scale mining operations.

If there is a resurrection of U.S. deep seabed mining activity, assuming that the major impediments to further U.S. involvement are overcome, it will be up to the Congress to assure sufficient appropriations to adequately assess environmental impacts.

RECOMMENDATIONS

Recommendations Concerning the Law of the Sea Treaty

The role of the Congress has been critical to seabed mining activities in the United States, and it will continue to play a major role in developing policy guidelines for ocean mineral development because of its involvement in the Law of the Sea Advisory Committee, review and evaluation of the new administration's position on the Law of the Sea Treaty, treaty ratification hearings, and implementing legislation. These responsibilities provide the Congress with a continuing opportunity to assure that the commercial recovery of seabed mineral resources is realized in the most orderly manner. In this context, we recommend that the Congress:

--Accept reasonably assured access to mine sites. The Congress should accept the fact that guarantees for access to mine sites are unrealistic in the absence of sovereign rights to mineral resources; that the absence of such absolute rights is not in itself a fundamental shortcoming of the draft treaty; and that reasonable access can be provided under provisions of the draft treaty subsequent to Preparatory Commission deliberations.

--Insist on long-term investment protection. The overall viability of seabed mining is contingent upon access to mine sites beyond first generation mining, and reasonable assurances for that access must be pursued. The Congress should insist that changes to the basic nature of the parallel system in the review conference proceedings not be acceptable. Fundamental changes which could alter terms of access must be assured against by either (1) restricting the procedures in which the Assembly might change the mining system (either requiring a concensus in the Assembly or providing that the Assembly cannot bring about changes without Council concurrence), or (2) seeking limits to review conference authority to changes that do not alter the basic operational structure under which mining is currently taking place.

--Reassert the need to protect interim investments. The Congress has agreed, through the 1980 Act, to the need to assure that investments made prior to entry into force of a treaty should be protected.

--Insist on alternative means of protecting developing countries' economies. The objective of protecting these economies, sought with inclusion of production controls in the draft treaty, warrants congressional support. But, because the current production control provisions would be cumbersome to apply and perhaps counterproductive to investment, and certainly not the only means by which the objectives of protecting developing country incomes might be achieved, the Congress should insist on the careful development of alternatives for achieving income protection objectives while minimizing disincentives. (See pp. 22 and 23.)

--Ensure that compensation for transferred technology is adequate to protect the developers' investments, and that recipients of proprietary technology safeguard it against unauthorized disclosure.

In addition, the Congress should concentrate now on getting the recommendations above implemented which will minimize issues potentially subject to dispute settlement procedures. Acceptability and/or feasibility of dispute settlement mechanisms we do not believe can be realistically divorced from the nature and number of issues which might have to be subject to formal dispute settlement procedures.

Recommendations Concerning Mineral Conservation

On the assumption that the United States proceeds with the Law of the Sea Treaty process, the Congress should make sure that industry plans for mining and disposing of all four primary nodule minerals are evaluated and monitored for consistency with conservation goals of the 1980 Act. Efforts to continue or expand Federal research and development into new markets for manganese should be considered.

Recommendations Concerning Environmental Protection

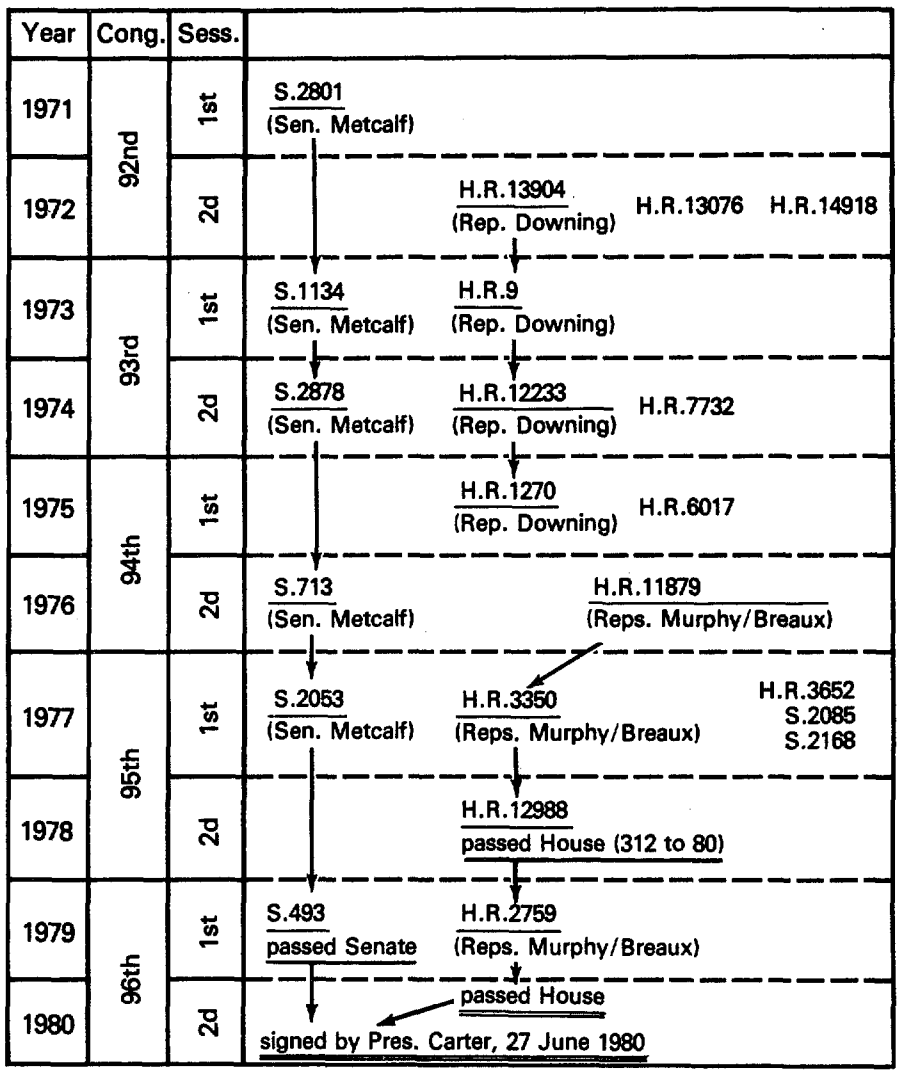
Also on the assumption that the United States proceeds with the Law of the Sea Treaty process, the Congress, to assure the protection of the quality of the environment, should:

--Make sure that appropriate support for environmental research is available for NOAA's Office of Ocean Minerals and Energy, consonant with environmental assessment activity mandated by the 1980 Act and necessary prior to commercial recovery operations.

--Direct that NOAA carry out assessments of industry mining activities. Of particular concern should be activities which evaluate the impacts of new engineering and equipment.

APPENDIX I

PROPOSED U.S. DEEP SEABED MINING LEGISLATION FROM 1971 TO PASSAGE OF THE DEEP SEABED HARD MINERAL RESOURCES ACT, JUNE 28, 1980:



TECHNOLOGY TRANSFER: FAIR AND REASONABLE COMMERCIAL TERMS AND CONDITIONS 1/

During the Intersessional period the United States Delegation undertook to ascertain with a greater degree of clarity what was meant by the phrase "fair and reasonable commercial terms and conditions". Although it was not possible to come up with a precise definition of this terminology, the United States Delegation was able to compile a number of examples of terms which would in general be regarded in commercial terms as fair and reasonable. These examples have been drawn from practices firmly established in commercial licensing agreements and transactions involving technology transfers.

It is not possible or appropriate to set out in advance what would be fair and reasonable commercial terms and conditions in all circumstances, or for all such transactions. Rather the list compiled here represents examples which, in light of commercial practices in relevant trades, are generally considered fair and reasonable measures to protect the technology being transferred, to ensure fair compensation to its owner and to protect the recipient of the technology. These provisions include terms that:

(1) establish a price - in specie, in kind or in other appropriate form - which provides a fair return to the owner for the transfer of the technology and any related services provided and which may be based on factors such as the cost of developing the technology (including direct research and development costs, overhead and other indirect costs, and taking into account the cost of the total development effort including unsuccessful projects), the risk to which the owner was exposed in developing the technology, the uniqueness of the technology, the profit or benefits to be derived or passed on by the Enterprise and a reasonable profit to the owner;

(2) provide security for payments by means of letters of credit or other devices;

(3) limit the use of the technology by the Enterprise to exploration and exploitation of the deep seabed;

(4) provide for termination of the agreement in the event of substantial breach of the agreement;

(5) require that the Enterprise provide to the owner, on an exclusive or non-exclusive basis and without royalties, any improvements which it makes in the technology transferred to it (known as "grantbacks");

1/Informal working paper provided by Elliot L. Richardson, former U.S. Ambassador to the Law of the Sea Conference.

(6) ensure appropriate protection and proper handling of leased equipment;

(7) protect the secrecy of the technology, including restrictions on sub-licensing or assigning the technology to third parties;

(8) require indemnification by the Enterprise to the owner in the event the Enterprise causes damage to others by misuse of the technology and the owner is held liable;

(9) make appropriate provisions for the protection of the Enterprise in its use of the technology, such as warranties as to the validity of any patent;

(10) ensure that if there are any warranties of new technology, they take into account the untested nature of the technology; and

(11) provide for a commercial arbitration mechanism to adjudicate any disputes arising within the scope of the contract for the transfer of technology including questions of financial or other damages to be awarded.

APPENDIX III

PRINCIPAL ENVIRONMENTAL PROTECTION FEATURES OF P.L. 96-283 WHICH NOAA IS REQUIRED TO ACCOMPLISH

--Environmental Assessment

1. NOAA is required to expand and accelerate the program assessing the effects on the environment from exploration and commercial recovery activities, including sea-based processing and the at-sea disposal of processing wastes.

2. NOAA is required to conduct a continuing program of ocean research to support environmental assessment activity through the period of exploration and commercial recovery authorized by the Act. And, within 160 days of enactment of the Act, develop a 5-year plan to carry out the research program.

--Programmatic Environmental Impact Statement

1. NOAA is required to develop programmatic environmental impact statements (PEIS) if, after consultation with the administrator of the EPA and other Federal agencies, it is determined such statements are required. A PEIS shall be considered for each area of the ocean where any U.S. citizen is expected to undertake exploration and commercial recovery. The Act sets specific time frames for NOAA to prepare draft and final PEISs for the area where initial activity will occur.

--Environmental Impact Statements on Issuance of Licenses and Permits

1. NOAA is to provide environmental impact statements for each license or permit.

--Terms, Conditions, and Restrictions

1. NOAA must ensure that each license and permit issued for exploration and commercial recovery contains terms, conditions, and restrictions to assure protection of the environment. Such terms, conditions, and restrictions are to be developed after consultation with the Administrator of the Environmental Protection Agency, the Secretary of State, and the head of whichever department is responsible for the Coast Guard.

In addition to NOAA's environmental responsibilities, the Act further requires the Secretary of State, in cooperation with the Administrator of NOAA, to negotiate with other nations for the purpose of establishing international stable reference areas in which

no mining can take place. Within 4 years of the enactment of the Act, the Secretary of State must submit a report to the Congress on the progress in establishing such stable reference areas, including the designation of appropriate zones to insure a representative and stable biota of the deep seabed.

Each licensee or permittee is also required to monitor the environmental effects of the exploration and commercial recovery activities in accordance with NOAA guidelines, and to submit such information as NOAA finds necessary to assess and mitigate adverse environmental impacts.

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