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Kindt, John Warren

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The Environmental Aspects of Deep Seabed Mining*

John Warren Kindt **

I.

INTRODUCTION

This article should highlight some of the prevalent environmental issues associated with deep seabed mining. As of 1988, the available environmental scientific data¹ had not greatly modified the analyses or conclusions reached in the environmental reports of the early 1980s.² Hopefully, this review of the environmental issues will provide some perspective on the interface between deep seabed mining

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** Professor, University of Illinois; SJD 1981, LL.M. 1978, University of Virginia; J.D. 1976, MBA 1977, University of Georgia; A.B. 1972, William and Mary.

1. See NATIONAL OCEANIC & ATMOSPHERIC ADMIN., U.S. DEP'T OF COMMERCE, DEEP SEABED MINING: REPORT TO CONGRESS (1987); NATIONAL OCEANIC & ATMOSPHERIC ADMIN., U.S. DEP'T OF COMMERCE, DEEP SEABED MINING: REPORT TO CONGRESS (1985). The "final environmental impact statements" (FEISs), issued to various U.S. companies in anticipation of the initiation of deep seabed mining activities, consist primarily of letters commenting on the pre-existing environmental data collected during the late 1970s and early 1980s. See, e.g., NATIONAL OCEANIC & ATMOSPHERIC ADMIN., U.S. DEP'T OF COMMERCE, DEEP SEABED MINING: FINAL ENVIRONMENTAL IMPACT STATEMENT ON ISSUING EXPLORATION LICENSES TO KENNECOTT CONSORTIUM (1984) [hereinafter KENNECOTT FEIS]; NATIONAL OCEANIC & ATMOSPHERIC ADMIN., U.S. DEP'T OF COMMERCE, DEEP SEABED MINING: FINAL ENVIRONMENTAL IMPACT STATEMENT ON ISSUING AN EXPLORATION LICENSE TO OCEAN MANAGEMENT, INC. (1984) [hereinafter OCEAN MANAGEMENT FEIS]; NATIONAL OCEANIC & ATMOSPHERIC ADMIN., U.S. DEP'T OF COMMERCE, DEEP SEABED MINING: FINAL ENVIRONMENTAL IMPACT STATEMENT ON ISSUING AN EXPLORATION LICENSE TO OCEAN MINERALS COMPANY (1984) [hereinafter OCEAN MINERALS FEIS]; NATIONAL OCEANIC & ATMOSPHERIC ADMIN., U.S. DEP'T OF COMMERCE, DEEP SEABED MINING: FINAL ENVIRONMENTAL IMPACT STATEMENT ON ISSUING AN EXPLORATION LICENSE TO OCEAN MINING ASSOCIATES (1984) [hereinafter OCEAN MINING FEIS].

2. See J. KINDT, 2,3 MARINE POLLUTION AND THE LAW OF THE SEA chs. 10, 18 (1986) [hereinafter MARINE POLLUTION]; Kindt, *Deep Seabed Exploitation*, 4 U.C.L.A. J. ENVTL. L. & POL'Y 1 (1984) [hereinafter *Seabed Exploitation*]; Kindt, *Particulate Pollution and the Law of the Sea*, 12 B.C. ENVTL. AFF. L. REV. 273 (1985) [hereinafter *Particulate Pollution*].

and marine pollution. While necessarily cursory, this analysis should, nevertheless, alert diplomats involved in law of the sea issues, as well as the deep seabed mining industry, to the potential problems arising when exploiting the nonliving resources of the ocean. This analysis should also provide some perspective on U.S. environmental activities pursuant to the Deep Seabed Hard Minerals Resources Act of 1980 (Seabed Resources Act or DSHMRA)³ and on international environmental policies pursuant to the 1982 Convention on the Law of the Sea (LOS Convention)⁴ negotiated during the Third United Nations Conference on the Law of the Sea (UNCLOS III).⁵

A review of environmental issues is particularly important because the traditional and common viewpoint is that the ocean possesses an unlimited assimilative capacity for pollution.⁶ For some years this viewpoint has been the minority viewpoint among environmental academics and it is continuing to lose support; and yet this misperception keeps reappearing.⁷ Jacques Cousteau demonstrated that portions of the ocean are already under severe stress when he warned that the entire Mediterranean Sea could pass an "environmental threshold"⁸ and collapse environmentally into a dead sea.⁹

II.

THE ENVIRONMENTAL ASPECTS OF DEEP SEABED MINING

A. *The Environmental Problems Associated with Deep Seabed Mining*

1. The Overall Problems

Throughout the 1970s and 1980s deep seabed mining has been

3. 30 U.S.C. §§ 1401-1473 (1982 & Supp. III 1985).

4. United Nations Convention on the Law of the Sea, Dec. 10, 1982, U.N. Doc. A/CONF.62/122 (1982), reprinted in 21 I.L.M. 1261 (1982) [hereinafter LOS Convention].

5. For an excellent article that discusses the interface between the LOS Convention and the issues involving deep seabed mining, see Iguchi, *Japan and the New Law of the Sea: Facing the Challenge of Deep Seabed Mining*, 27 VA. J. INT'L L. 527 (1987).

6. Kindt, *International Environmental Law and Policy: An Overview of Transboundary Pollution*, 23 SAN DIEGO L. REV. 583, 584, 602-03 (1986) [hereinafter *Transboundary Pollution*].

7. See *id.* at 584, 602-03.

8. *Id.* at 585-86, 602-03.

9. McManus & Schneider, *Shipwrecks, Pollution and the Law of the Sea*, PARKS & CONSERVATION MAG., ENVTL. J., June 1977, at 10; *Transboundary Pollution*, *supra* note 6, at 586.

primarily oriented toward the potential of recovering manganese nodules. One of the major potential areas for the mining of manganese nodules is the Clarion-Clipperton Zone in the east-central Pacific Ocean.¹⁰ This area consists of an east-west belt of ocean area, just south of Hawaii.¹¹ As well as including ocean areas "beyond the limits of national jurisdiction" (*i.e.*, the "Area"),¹² the Clarion-Clipperton Zone apparently overlaps the economic zones (EEZs)¹³ of both the United States and Mexico. Accordingly, the Clarion-Clipperton Zone highlights the jurisdictional aspects of the environmental problems associated with the recovery of manganese nodules both in EEZs and in international waters.

Due to its economic importance, after 1982 the Clarion-Clipperton Zone became the situs of several claims by international consortia and by individual countries.¹⁴ Overlapping claims were initially made by France, Japan, and the USSR,¹⁵ but these overlapping claims were apparently resolved in February of 1986 in a meeting held in Arusha, Tanzania, which resulted in the "Arusha Understanding,"¹⁶ designed to prevent disputes over jurisdiction to the deep seabed resources.

Since the Clarion-Clipperton Zone has long constituted a primary area for the exploitation of manganese nodules, in the mid-1970s this area was selected as the subject of the first U.S. Deep Ocean Mining Environmental Study (DOMES).¹⁷ The DOMES formed

10. See Larson, *Deep Seabed Mining: A Definition of the Problem*, 17 OCEAN DEV. & INT'L L. 271, 281-82 (1986).

11. *Id.* at 280.

12. See LOS Convention, *supra* note 4, art. 1, para. 1.

13. Under article 57 of the LOS Convention, a coastal State may claim up to a 200-mile economic zone. LOS Convention, *supra* note 4, art. 57. The common terminology for economic zone is "exclusive economic zone" (EEZ), but since a coastal State's rights in its economic zone are definitely not exclusive, the more appropriate terminology is just "economic zone." See, e.g., MARINE POLLUTION, *supra* note 2, at 1474 n.359; Kindt, *Claims to Jurisdiction Over the Environment of the Continental Shelf*, 21 CAL. W.L. REV. 1, 38 n.328 (1984) [hereinafter *Continental Shelf*]. See generally MARINE POLLUTION, *supra* note 2, at 1424-79; *Continental Shelf*, *supra* at 1-43.

14. Larson, *supra* note 10, at 281-82.

15. *Id.* at 282; *Recent Developments in the Law of the Sea 1986*, 24 SAN DIEGO L. REV. 701, 703-04 (1987) [hereinafter *Developments 1986*].

16. Understanding Relating to Applications for Registration of Mine Sites Under Resolution II, Feb. 5, 1986, reprinted in Statement Made by the Acting Chairman of the Preparatory Commission, at 9, U.N. Doc. LOS/PCN/L.41/Rev.1 (1986) [hereinafter *Arusha Understanding*]; see *Developments 1986*, *supra* note 15, at 704.

17. Generally, DOMES is also used to refer collectively to two reports; specifically, NATIONAL OCEANIC & ATMOSPHERIC ADMIN., U.S. DEP'T OF COMMERCE, PROJECT DEVELOPMENT PLAN: DOMES DEEP OCEAN MINING ENVIRONMENTAL STUDY (1977); NATIONAL OCEANIC & ATMOSPHERIC ADMIN., U.S. DEP'T OF COMMERCE,

the basis of many of the scientific findings presented in the 1981 Final Programmatic Environmental Impact Statement on Deep Seabed Mining (Seabed EIS)¹⁸ completed by the U.S. National Oceanic and Atmospheric Administration (NOAA). The DOMES constituted a cooperative NOAA/industry research effort conducted between 1975 and 1981.¹⁹ Thereafter, NOAA's actions paralleled suggestions to use the Seabed EIS as a base²⁰ for future specialized "environmental impact statements" (EISs) required under the Seabed Resources Act²¹ and conforming to the National Environmental Policy Act of 1969 (NEPA).²²

Those deep seabed mining consortia which included U.S. companies as members would be required to conduct their operations pursuant to licenses from NOAA which provide that only exploration and research could be conducted until 1988. Beginning January 1, 1988, commercial mining by U.S. companies could be commenced once they obtained NOAA permits and complied with other applicable laws and regulations.²³ For economic reasons, however, commercial mining is unlikely to begin until after the year 2000.

Prior to 1980, no formal regulatory standards existed for deep seabed mining operations. Existing laws and regulations in the United States dealt with export control, taxes, trade, maritime activities, and occupational health and safety, but left the marine environment largely unprotected. Environmentalists feared that deep seabed mining could begin prior to the establishment of international environmental standards, such as the type of standards later embodied in the LOS Convention.²⁴ This fear prompted U.S. environmentalists to call for efforts to provide domestic legislation to conserve and protect the marine environment.²⁵

Among the theoretical effects of deep seabed mining causing envi-

TECHNICAL DEVELOPMENT PLAN: DOMES DEEP OCEAN MINING ENVIRONMENTAL STUDY (1977).

18. NATIONAL OCEANIC & ATMOSPHERIC ADMIN., U.S. DEP'T OF COMMERCE, 1 DEEP SEABED MINING: FINAL PROGRAMMATIC ENVTL. IMPACT STATEMENT xv (1981) [hereinafter SEABED EIS].

19. *Id.* at xvi.

20. *Seabed Exploitation*, *supra* note 2, at 18-19; see *Particulate Pollution*, *supra* note 2, at 279.

21. 30 U.S.C. § 1419.

22. 42 U.S.C. §§ 4321, 4332(2)(c) (1982).

23. SEABED EIS, *supra* note 18, at 7.

24. See LOS Convention, *supra* note 4. See generally, Whitney, *Environmental Regulation of United States Deep Seabed Mining*, 19 WM. & MARY L. REV. 77 (1977); Note, *A New Combination to Davy Jones' Locker: Melee Over Marine Minerals*, 9 LOY. U. CHI. L.J. 935 (1978) [hereinafter Note, *New Combination*].

25. Note, *New Combination*, *supra* note 24, at 952.

ronmentalists' concern was that suction-lift mining equipment would move sediment and "near bottom" water to the ocean surface—unless the equipment was designed to discharge the sediment at an earlier point. The colder and denser "near bottom" water could injure marine life not adapted to it and could unpredictably disrupt some types of marine life (such as formerly-dormant ancient spores). The environmentalists also envisioned a "dark plume" or "red plume" over a large area of water surface caused by the discharge of red clay sediments during the recovery process. Such a discharge could fundamentally alter the nature of the euphotic zone in the region.²⁶ In addition, the blending of benthic ocean water and sediment into the surface water could theoretically generate an increase in phytoplankton and blooms of organisms not usually found in the pelagic zone of ocean areas overlying concentrations of manganese nodules.²⁷

Environmentalists were apparently concerned that the lifted sediments would cause a "rain of fines" (essentially a type of particulate pollution) and would become suspended for long periods of time in the water column. The international environmental community feared that these suspended sediments could cause "the transplantation of spores or other dormant forms of organisms from one area to another, where favorable temperature, light, and oxygen conditions in the overlying water . . . [could] reactivate them."²⁸ Alien antibodies could also be released from these spores and organisms lying in the sediment and infect living ocean resources in incalculable ways.²⁹ Mindful of these environmental considerations, the United States incorporated environmental safeguards into the Seabed Resources Act.³⁰

The basic manganese nodule mining techniques are: (1) airlift pumping (ALP), (2) hydraulic or hydro-lift dredging (HD), and (3) continuous line bucket dredging (CLB). Of course, the biological activity and the sediment are likely to be disturbed by either a suction or a bucket system as it travels across the benthos.³¹ However, the impacts of this disturbance could arguably be minimal because: (1) the ocean currents of the benthos naturally move the sediment, (2) most of the disrupted sediment is expected to resettle on the

26. Frank, *Environmental Aspects of Deepsea Mining*, 15 VA. J. INT'L L. 815, 818 (1975).

27. *Id.*

28. Whitney, *supra* note 24, at 80.

29. *Id.*

30. *See, e.g.*, 30 U.S.C. § 1419.

31. Frank, *supra* note 26, at 818.

ocean floor, and (3) most of the ocean bottom where the deepsea mining will occur is supposedly uninhabited by marine life.³²

The processing of the manganese nodules either onboard the recovery ship or on another vessel presents another potential problem. Most deep seabed mining companies can be expected to extract only manganese, copper, cobalt, and nickel from the nodules—and perhaps as few as one or two of these metals. The remaining trace metals will theoretically be discarded either on land or at sea.³³ As part of the processing, highly polluting chemicals incorporating either heavy alkaline or acid chemical agents could also be dumped.³⁴

Obviously, the long-term economic development of the deep seabed mining industry is dependent upon a regulatory regime which addresses the environmental aspects of processing these metals at sea.³⁵ In the United States, the industry must also serve the objective promulgated in the Seabed Resources Act of promoting the conservation and the maximum utilization of the metals contained in manganese nodules—even those metals which might normally be discarded as part of processing.³⁶ This provision in the Seabed Resources Act is interesting because when developed, all resources should be maximized—as little as possible should be wasted. In the Seabed EIS, the potential environmental problems that might be encountered in processing activities onboard the manufacturing ships were not addressed, because this method of processing was deemed impracticable.³⁷ The motion of the ship while at sea would allegedly make such processing both difficult and costly.³⁸ Since costly technology would have to be developed before offshore processing could take place, processing activities onboard the manufacturing ships was not expected to occur during the first generation of commercial mining.³⁹ In 1986, NOAA reaffirmed this conclusion in the proposed regulations to govern deep seabed mining by U.S. companies.⁴⁰

32. *Id.*

33. *Id.* at 819.

34. *Id.*

35. Whitney, *supra* note 24, at 81.

36. *See* 30 U.S.C. § 1420.

37. SEABED EIS, *supra* note 18, at xix.

38. *Id.* at 229-30.

39. *Id.* at xix.

40. 51 Fed. Reg. 26,794, 26,795 (1986) (proposed July 25, 1986) (at-sea processing not considered since deemed impractical). Prior to these proposed regulations, NOAA had issued an Advance Notice of Proposed Rulemaking (ANPR), 47 Fed. Reg. 57,904 (December 28, 1982).

2. The Specialized U.S. Problems

The Seabed Resources Act was designed to utilize a concept of "stable reference areas" (SRAs)⁴¹ to monitor environmental impacts once U.S. deep seabed mining actually commenced. The Act defined an SRA as an area "of the deep seabed to be used as a reference zone . . . for purposes of resource evaluation and environmental assessment of deep seabed mining in which no mining will occur."⁴² Pursuant to a regulatory mandate granted the Administrator of NOAA in 1986, the Administrator promulgated proposed rules for U.S. deep seabed mining⁴³ designed to expand the initial regulations issued in 1981.⁴⁴ To accommodate changing technologies and new developments, including "the availability of new environmental data and results of monitoring,"⁴⁵ the proposed regulations attempted to provide a clear regime while maintaining flexibility by "deferring detailed decisions on permit-specific terms, conditions and restrictions (TCRs) until the time of permit issuance."⁴⁶ Notably, NOAA also recognized the necessity to protect unique marine environments⁴⁷ as "marine sanctuaries,"⁴⁸ which affirmed a protective policy often overlooked or dismissed by countries in general, due to the pressures associated with competitively developing resources.

The introductory material to the proposed regulations conceded that there was only preliminary information available on the technology to be utilized and on the "consequent environmental effects to be expected from commercial-scale seabed mining."⁴⁹ Furthermore, this dearth of information was compounded by "the lack of complete knowledge about the deep ocean environment where mining . . . [was] to occur."⁵⁰ While the scientific community could sympathize with the difficulties of making decisions based on little or no data, there appeared to be concern that before instituting many safeguards, NOAA might wait for the large volume of scien-

41. 30 U.S.C. § 1419(f). For a detailed discussion of the practical aspects of SRAs, see NATIONAL RESEARCH COUNCIL, DEEP SEABED STABLE REFERENCE AREAS (1984) [hereinafter STABLE REFERENCE AREAS].

42. 30 U.S.C. § 1419(f)(4).

43. 51 Fed. Reg. 26,794.

44. 15 C.F.R. Part 970 (issued Sept. 15, 1981).

45. 51 Fed. Reg. 26,794.

46. *Id.*

47. 30 U.S.C. § 1415(b)(1); see 51 Fed. Reg. 26,799.

48. For an analysis of the concept of marine sanctuaries, see MARINE POLLUTION, *supra* note 2, ch. 23.

49. 51 Fed. Reg. 26,799.

50. *Id.*

tific information that would normally be acquired during the years that commercial mining was in progress.⁵¹ This concern was heightened by the preliminary NOAA conclusion that “[m]ost of the environmental impact concerns associated with deep seabed mining have been shown to have little probability of emerging as significant adverse impacts during commercial scale mining.”⁵² Understandably, the scientific and the environmental communities wanted to ensure that there was close environmental monitoring,⁵³ and NOAA concurred with this suggestion. In fact, NOAA was already recommending a monitoring program to supplement the Seabed EIS,⁵⁴ and the proposed regulations not only required the “submission of a monitoring plan at the time of permit application,”⁵⁵ but also retained the potential for eventually requiring federal environmental observers onboard the mining ships.⁵⁶

In any event, the proposed regulations generated a significant response from the environmental community, which, in part, prompted NOAA to issue supplemental proposed regulations.⁵⁷ There were five major areas of environmental concern. First, the suggestion was made that due to the lack of scientific data, “NOAA should undertake an expanded program of environmental assessment,”⁵⁸ and secondly, that it was improper for NOAA to accept a presumption of no significant adverse environmental effects.⁵⁹ Thirdly, a permit duration of twenty years was deemed to be too long, considering the lack of scientific data.⁶⁰ The last two concerns were related; both responded to the facts that as structured by NOAA, the environmental information would be “available only after adverse effects”⁶¹ had already occurred and that the proposed regulatory process relied on “after-the-fact monitoring to develop the information needed to assess adverse impacts, and then . . . [failed] to provide assurance that this information . . . [would] be used to modify permits so that harmful practices . . . [were] stopped

51. *Id.*

52. *Id.*; *see id.* at 26,800 (“pre-license phase mining tests demonstrated no significant adverse effect”).

53. *See* 51 Fed. Reg. 26,799-800.

54. 51 Fed. Reg. 26,800; *see* 15 C.F.R. § 971.602.

55. 51 Fed. Reg. 26,800; *see* 15 C.F.R. § 971.203(b)(5).

56. 51 Fed. Reg. 26,801; *see* 15 C.F.R. § 971.602(i).

57. 52 Fed. Reg. 34,748 (1987) (proposed Sept. 14, 1987).

58. *Id.* at 34,749.

59. *Id.*

60. *Id.*

61. *Id.*

or mitigated.”⁶² NOAA addressed these issues, and some concerns were alleviated by the establishment of ten environmental guidelines,⁶³ while other concerns were alleviated by elaborating upon the concept of stable reference areas⁶⁴ to incorporate impact reference areas (IRAs) and preservational reference areas (PRAs).⁶⁵

The IRAs were conceptualized as being located within the permit areas and as being used to evaluate the general environmental impacts and the specific benthic impacts of the deep seabed mining. The PRAs were to consist of “interim” areas which were within the permit areas but which were considered to be non-mineable.⁶⁶ The PRAs were to be used to compare relatively undisturbed areas with mined areas.⁶⁷ On the international level, such a system should be incorporated into the parallel mining system to be implemented by the Enterprise⁶⁸ under Part XI of the LOS Convention and to be governed by the International Sea-Bed Authority (ISA or “the Authority”).⁶⁹ Due to the crossing patterns inherent in the “parallel” system, special care would have to be taken to ensure that IRAs and PRAs were established in all of the mining areas and validly reflected differences in ecosystems.

Given the problems associated with monitoring “flow resources”⁷⁰ (e.g., fish, marine mammals) and even the water column itself (a “space-extension resource”),⁷¹ a NOAA policy of utilizing some spot-check reference areas would be reasonable. In any event, the SRAs, IRAs, and PRAs are beginning to implement the principle of utilizing fate and effects studies as recommended in the early 1980s.⁷² While the SRA system has generated some criticism as

62. *Id.*

63. *Id.*

64. 30 U.S.C. § 1419(f).

65. 52 Fed. Reg. 34,750.

66. See Council on Ocean Law, *Oceans Policy News*, Oct.-Nov. 1987, at 9-10.

67. 52 Fed. Reg. 34,750.

68. See LOS Convention, *supra* note 4, art. 170.

69. *Id.* arts. 156-158.

70. For a description and discussion of flow resources, see Kindt, *Ocean Resources and Marine Pollution: Putting the Development of Ocean Resources in Proper Perspective*, 6 Hous. J. INT'L L. 111, 112-13 (1984) [hereinafter *Ocean Resources*], reprinted in *MARINE POLLUTION*, *supra* note 2, ch. 2.

71. For a description and discussion of space-extension resources, see *Ocean Resources*, *supra* note 70, at 113.

72. See, e.g., *Seabed Exploitation*, *supra* note 2, at 19. While more baseline scientific data on seabed mining is obviously necessary, efficiency is promoted by the general principle of adding EISs to the 1981 Seabed EIS. This principle has been incorporated into the stage for issuing exploration licenses. Compare SEABED EIS, *supra* note 18, with KENNECOTT FEIS, *supra* note 1; OCEAN MANAGEMENT FEIS, *supra* note 1; OCEAN MINERALS FEIS, *supra* note 1; OCEAN MINING FEIS, *supra* note 1. Of course,

including an imperfect scientific methodology,⁷³ the trends by NOAA to utilize an SRA system and "fate and effects" studies should be applauded and encouraged.

B. *The Overall U.S. and International Goals*

The traditional mainstays of an ocean foreign policy include five goals: (1) security, (2) management (avoidance, reduction, and settlement) of conflict, (3) promotion of efficiency and fair access in ocean use, (4) protection of the environment, and (5) promotion of ocean knowledge.⁷⁴ A sixth overall goal, which impacts on all of these other goals, is the "maintenance of a favorable legal order."⁷⁵ The traditional goal of "protecting the environment" necessarily includes the marine environment and also requires adequate environmental safeguards relating to other environmental problem areas.⁷⁶ This latter goal was incorporated into the Seabed Resources Act via the requirements for a subsequent Deep Ocean Mining Environmental Study (DOMES)⁷⁷ and a programmatic environmental impact statement.⁷⁸

An integral part of maintaining a favorable world public order consists of providing mechanisms for the pacific settlement of disputes.⁷⁹ In this regard, the dispute settlement provisions of the LOS Convention are unique⁸⁰ and should serve as a model for other pending treaties, particularly environmental treaties. Under the LOS Convention, the compulsory nature of the mechanisms for peacefully settling disputes is a major accomplishment.⁸¹ In addi-

special care must be taken when utilizing this system, because any errors become magnified. See Letter to James Lawless, Chief of the Ocean Minerals and Energy Division of the National Oceanic and Atmospheric Administration, from Clifton Curtis on behalf of the Oceanic Society, July 13, 1984 (commenting on NOAA's Manganese Nodule Deep Seabed Mining Exploration License FEISs, 49 Fed. Reg. 20,359 (1984)), reprinted in KENNECOTT FEIS, *supra* note 1, at 15-26.

73. STABLE REFERENCE AREAS, *supra* note 41, at 1-3.

74. Moore, *A Foreign Policy For The Oceans*, in THE OCEANS AND U.S. FOREIGN POLICY 1, 2 (Center for Oceans Law & Pol'y, Apr. 1978).

75. *Id.* at 2.

76. *See id.*

77. 30 U.S.C. § 1419(a).

78. *Id.* § 1419(c).

79. Sohn, *Pacific Settlement of Disputes and International Security*, NEGOTIATION J., Apr. 1987, at 155, 155-59, 164-65; see Sohn, *U.S. Policy Toward the Settlement of Law of the Sea Disputes*, 17 VA. J. INT'L L. 9 (1976) [hereinafter *U.S. Disputes*].

80. See, e.g., MARINE POLLUTION, *supra* note 2, at 2044, 2047; *U.S. Disputes*, *supra* note 79, at 21.

81. See MARINE POLLUTION, *supra* note 2, at 2046. For a historical and comprehensive analysis of the UNCLOS III negotiations involving dispute settlement, see

tion, these provisions provide alternative methods for resolving disputes—for the first time creating a dispute settlement system acceptable to virtually all countries, including the Soviet bloc, the Third World (e.g., the Group of 77), and the Western bloc. Those diplomats negotiating pending treaties, particularly treaties dealing with international environmental issues, should look to the dispute settlement provisions in the LOS Convention.

Despite the benefits of the dispute settlement provisions, the basic problem areas outlined in the previous discussions complicate the achievement of a favorable world order: (1) by the fact that there is less technical knowledge about maintaining the deep seabed environment than about disturbing it; (2) by several political and institutional considerations that could hinder or negate support for strong environmental regulation; and (3) by possible conflicts of interest within the ISA.⁸² In the context of the mini-Treaty regime outside the restrictions of Part XI, it is interesting to note that the U.S. Secretary of State may not designate an allied country as a reciprocating State pursuant to the Seabed Resources Act unless that ally requires those companies mining under its authority to protect the environment.⁸³ Accordingly, those countries which are granted the status of reciprocating States under the Seabed Resources Act must institute "adequate" measures to protect the marine environment. Of course, there is some question as to what environmental safeguards constitute "adequate measures for the protection of the environment,"⁸⁴ as required by the Seabed Resources Act.

Obviously, the orderly development of a deep seabed mining regime which will provide stability of expectations requires the maintenance of a favorable legal order that includes the establishment of both economic and environmental guidelines. Within the international environmental realm, both individual countries and the ISA should adopt the principle of utilizing SRAs, IRAs, and PRAs to monitor the environmental impacts of deep seabed mining activities. Monitoring within the ISA system should be accomplished with teams of scientists from those countries with the most advanced

Sohn, *Settlement of Disputes Arising Out of the Law of the Sea Convention*, 12 SAN DIEGO L. REV. 495 (1975). See also *U.S. Disputes*, *supra* note 79, at 9.

82. Nyhart, *The Interplay of Law and Technology in Deep Seabed Mining Issues*, 15 VA. J. INT'L L. 827, 858-59 (1975).

83. 30 U.S.C. § 1428(a)(1).

84. *Id.*

technologies—regardless of their individual country's status vis-a-vis the LOS Convention.

Since most of the ocean areas containing commercially exploitable quantities of manganese nodules were located seaward of the limits of national jurisdiction as recognized by customary international law, the delegations to UNCLOS III attempted to formulate a widely acceptable and equitable international regime to govern the economic and the environmental aspects of deep seabed mining.⁸⁵

It was apparent that pollution from commercial mining could theoretically harm the marine environments of many coastal States and perhaps generate international conflict. Those countries with large fishing industries, as well as coastal States, could be seriously affected by drifting "red plumes" caused by seabed mining.⁸⁶ Accordingly, the overall problem of international marine pollution generated renewed interest and fostered recommendations during the early 1980s:

Since most of the ocean is beyond national jurisdiction, customary international law provides the standards for marine pollution. The U.S. regulations governing deep seabed mining should be at least as stringent as these international standards.⁸⁷ In addition, the U.S. standards should meet the environmental standards formulated at UNCLOS III,⁸⁸ because the United States might eventually ratify the LOS Convention and because the Convention's standards for marine pollution may already reflect customary international law. With the exception of the deep seabed mining provisions, the LOS Convention would seem to be "the best evidence today of customary international law."⁸⁹

Outside of the LOS Convention, customary international law was arguably ineffective to deal with the potential for ocean mining pollution.⁹⁰ In contrast to the general concepts embodied in customary international law, critics of customary international law could cite several specific anti-pollution provisions contained in the LOS Con-

85. Whitney, *supra* note 24, at 81.

86. See Note, *Interim Deep Seabed Mining Legislation: An International Environmental Perspective*, 8 J. LEGIS. 73, 78-79 (1981) [hereinafter Note, *Environmental Perspective*].

87. *Seabed Exploitation*, *supra* note 2, at 16; see Note, *Environmental Perspective*, *supra* note 86, at 79.

88. Note, *Environmental Perspective*, *supra* note 86, at 79.

89. *Seabed Exploitation*, *supra* note 2, at 16; Remarks by John Norton Moore, The United States Without the Law of the Sea Treaty: Opportunities and Costs, Proceedings from the Seventh Annual Conference of the Center for Ocean Management Studies, University of Rhode Island 111 (June 12-15, 1983).

90. Note, *Environmental Perspective*, *supra* note 86, at 79-80.

vention.⁹¹ For example, article 209 of the LOS Convention specified that commercial mining and other developmental activities in the Area would be subject to international rules, regulations, and procedures to be established by the ISA.⁹² Furthermore, article 194 required countries to ensure that activities under their control or jurisdiction did not cause pollution damage to other countries. Countries were required to the extent possible, to minimize: (1) the release of toxic, harmful, or noxious substances, (2) pollution from vessels, (3) pollution from installations and devices used to explore or exploit the seabed, and (4) pollution from other installations and devices operating in the ocean.⁹³ Of course, the supporters of the arguments for customary international law argued that these provisions in the LOS Convention merely codified pre-existing customary international law and that, alternatively, these provisions in the LOS Convention represented new but definite examples of new customary international law. However, as a caveat, it should be noted that if the ISA established an environmental standard under article 209 which was clearly a violation of international environmental norms, such a standard would not reflect customary international law.

Unfortunately, the deep seabed mining provisions in the LOS Convention emphasize development and deemphasize the essential balance between developmental activities and environmental protection. In addition, the industrialized countries were not granted the degree of representation which was commensurate with their international influence and with their capital investments in the seabed mining industry. A greater degree of representation by the industrialized countries would have inured to the benefit of the world's marine environment. This conclusion is particularly valid, because the "developing countries have traditionally evinced a reckless disregard for the environment, [and because] an ISA dominated by Third World countries can be expected to perpetuate a *de facto* unconcern for the marine environment regardless of the *de jure* concern expressed in the LOS Convention."⁹⁴

C. *Environmental Policy Considerations and Recommendations*

To understand the environmental implications of deep seabed mining, it is necessary to summarize the political context in which

91. *Id.* at 83-84.

92. LOS Convention, *supra* note 4, art. 209.

93. *Id.* art. 194.

94. *Seabed Exploitation*, *supra* note 2, at 26-27.

the environmental issues must necessarily be analyzed. On April 30, 1982, UNCLOS III ended with the adoption of the LOS Convention. Concerned with the deep seabed mining provisions (Part XI) contained in the LOS Convention, the United States announced that it would neither sign the LOS Convention⁹⁵ nor participate in the Preparatory Commission⁹⁶ (Prepcom)⁹⁷ charged with laying the groundwork for implementing certain provisions of the LOS Convention. The U.S. position was supported by some of its allies, chiefly the Federal Republic of Germany and the United Kingdom, but the Group of 77⁹⁸ and the Soviet bloc rejected the U.S. position and claimed that the deep seabed mining provisions were reasonable.⁹⁹

These divergent positions eventually evolved into a debate over whether the LOS Convention reflected pre-existing "customary international law," as well as whether the Convention incorporated new principles into customary international law. The Group of 77 argued that to claim any benefits under the LOS Convention, a country had to be a party to the LOS Convention.¹⁰⁰ From an academic perspective, however, it appeared that the LOS Convention did, indeed, generally reflect pre-existing customary international law¹⁰¹—except for the innovative and highly controversial provisions contained in Part XI, deep seabed mining. With regard to the provisions governing deep seabed mining, the controversy itself served to refute the argument that Part XI also reflected customary international law.

95. U.S. STATE DEP'T, LAW OF THE SEA AND OCEANS (Current Policy No. 416) (July-Aug. 1982).

96. *Id.*; see Iguchi, *supra* note 5, at 528-29.

97. See LOS Convention, *supra* note 4, res. I, para.1. For a history of the 1982 adoption of the LOS Convention and its subsequent status, see Iguchi, *supra* note 5, at 528-30.

98. The Group of 77 (or "G-77") consists of a voting block within the U.N. system. Originally consisting of 77 countries when the bloc was formed during the mid-1960s, by 1987 the Group of 77 included over 120 countries.

99. See Larson, *supra* note 10, at 275-76.

100. See UNITED NATIONS, THE LAW OF THE SEA xxxiv (1983) (Remarks by Ambassador Tommy T.B. Koh, President of UNCLOS III).

101. See Sohn, *The Law of the Sea: Customary International Law Developments*, 34 AM. U.L. REV. 271, 280 (1985) [hereinafter *Customary International Law*]. See also Sohn, *Symposium: The Law of the Sea Crisis*, 58 ST. JOHN'S L. REV. 237 (1986). "[A]ll provisions of the LOS Convention, except for seabed mining, are customary international law." MARINE POLLUTION, *supra* note 2, at 1577; *Seabed Exploitation*, *supra* note 2, at 43. "With the exception of the deep seabed mining provisions, the LOS Convention would seem to be 'the best evidence today of customary international law.'" MARINE POLLUTION, *supra* note 2, at 1549 (citing and endorsing the position of Professor John Norton Moore); *Seabed Exploitation*, *supra* note 2, at 16.

Throughout the mid-1980s, the trend appeared to be that, with the major exception of Part XI,¹⁰² the provisions in the LOS Convention generally reflected customary international law.¹⁰³ In the context of this overall debate involving customary international law, there was no debate involving the marine pollution provisions contained in the LOS Convention (*i.e.*, Part XII). The provisions in Part XII governing marine pollution definitely constituted customary international law.¹⁰⁴

Regardless of the divisive and complex issues inherent in the original debate involving Part XI of the LOS Convention, by 1987 several trends and conditioning factors had altered the fundamental nature of the debate. Underlying these developments was the realization that the "most controversial provisions of Part XI were based on assumptions or predictions . . . [which were] proven to be mistaken in important respects."¹⁰⁵ Several erroneous predictions forecasted continuing increases in the demand for deep seabed minerals, but by the mid-1980s it was apparent that "[a]ltered market conditions, discoveries of additional land-based sources, and the improved efficiency of land-based mining . . . [would] result in a long postponement (if not abandonment) of, and slower projected rates of growth for commercial deep seabed mining operations."¹⁰⁶ Furthermore, technological developments during the 1980s and the availability of that technology for conducting deep seabed mining changed many of the fundamental assumptions on which Part XI had been negotiated.¹⁰⁷ The equation was further altered by the possibility of exploiting other nonliving ocean resources in addition to manganese nodules.¹⁰⁸ Overshadowing all of these considerations was the fact that the deep seabed mining of manganese nodules would probably remain uneconomical until the twenty-first

102. For a discussion of whether some articles not in Part XI of the LOS Convention reflect customary international law, see Burke, Customary Law as Reflected in the LOS Convention: A Slippery Formula (July 10, 1987) (paper presented at the Annual Meeting of the Law of the Sea Institute, Aug. 3-6, 1987); Vicuna, International Ocean Law Developments in the Southeast Pacific: The Case of Chile (paper presented at the Annual Meeting of the Law of the Sea Institute, Aug. 3-6, 1987).

103. *Customary International Law*, *supra* note 101, at 280; see Council on Ocean Law, The United States and the 1982 Law of the Sea Convention: A Synopsis of the Status of the Treaty in 1987, 2 (Oct. 1987).

104. See, e.g., MARINE POLLUTION, *supra* note 2, at 1549, 1577; see generally, *id.*

105. Panel on the Law of Ocean Uses, Deep Seabed Mining and the 1982 Convention on the Law of the Sea 2 (Sept. 25, 1987) (sponsored by the Council on Ocean Law) [hereinafter Law Panel].

106. *Id.* at 2-3.

107. See *id.* at 3.

108. Law Panel, *supra* note 105, at 3.

century.¹⁰⁹ In addition, the implementation of essential environmental safeguards would further reduce the potential profit of deep seabed mining, which was another consideration largely overlooked by the Group of 77 during UNCLOS III.

These changed circumstances have revealed that for the foreseeable future, the United States and *arguendo* the other potential deep seabed mining countries have "limited economic and security interests in deep seabed mining."¹¹⁰ *A fortiori*, the developing countries have limited potential in the foreseeable future of benefiting economically from deep seabed mining. "But the United States shares *the compelling interests of all states* in achieving universal agreement on a comprehensive law of the sea, which requires agreement also on a regime for the deep seabed."¹¹¹ As consistently urged,¹¹² the United States has more to gain by utilizing a "two-track approach"¹¹³ than by working within the Prepcom system as an observer. Based upon the circumstances which existed in 1988, U.S. participation in Prepcom, even as an observer, would have sent an absolutely incorrect signal to the Group of 77 that the United States was wavering in its position.

Instead of working within the Prepcom system, the U.S. decided, beginning in 1984, to work with its allies¹¹⁴ within a system established under the Provisional Understanding Regarding Deep Seabed Mining (Provisional Understanding).¹¹⁵ Thus, there is the clear possibility that two different regimes for deep seabed mining could develop, operating to the detriment of the international marine environment.

The environmental safeguards which have been evolving in the United States under the auspices of NOAA, and which under the requirements of the Seabed Resources Act should necessarily be adopted by the U.S. allies,¹¹⁶ must eventually be incorporated into

109. See Larson, *supra* note 10, at 271.

110. Law Panel, *supra* note 105, at 5.

111. *Id.* (emphasis added); see Panel on the Law of Ocean Uses, *United States Policy on the Law of the Sea*, 79 AM. J. INT'L L. 151, 151-54 (1985).

112. See, e.g., MARINE POLLUTION, *supra* note 2, at 1577-78, 2320.

113. *Id.*

114. Those countries agreeing to join the United States in a "Provisional Understanding" included Belgium, the Federal Republic of Germany, France, Italy, Japan, the Netherlands, and the United Kingdom.

115. Aug. 3, 1984, T.I.A.S. No. 10562 (entered into force Sept. 2, 1984), *reprinted in* 23 I.L.M. 1354 (1984) [hereinafter Provisional Understanding]. The parties to the Provisional Understanding are the Federal Republic of Germany, France, Italy, Japan, the United Kingdom, and the United States.

116. See 30 U.S.C. § 1428(a)(1) (1982 & Supp. III 1985). Arguably, this provision

the framework being established at Prepcom. There is a greater likelihood that adequate environmental safeguards will be adopted during the earlier stages of Prepcom. Of course, it will be difficult for any negotiators to overcome the generalized U.N. preoccupation with implementing the principles of the New Economic Order¹¹⁷ at the expense of the international environment. Despite the *de jure* principles established during the 1972 U.N. Conference on the Human Environment (Stockholm Conference or UNCHE),¹¹⁸ there has been a *de facto* sacrificing of environmental concerns to rapid (and unwise) developmental activities.¹¹⁹

From an environmental perspective, the world is becoming smaller, and the irresponsible developmental activities of individual countries can impact upon the "strategic environment," and thereby, upon all humanity. The rapid deforestation of the planet, as demonstrated by the disappearing Amazon jungle, serves as one example. Unwise developmental policies have also rapidly transformed a part of the Panamanian rain forest into a man-made desert. However, the most alarming factor is that governments (including the United States via the World Bank system) continue to promote these developmental projects even after the serious environmental consequences have been identified and even after the uneconomical nature and failures of the developmental policies have been proven.¹²⁰ The gravamen is that these environmental situations and other similar environmental problems are generating and will continue to generate public concern over the world environment. Regardless of the actual environmental consequences of deep seabed mining, the increasingly powerful environmental community may become catalyzed by the specter of "red plumes" spreading over the ocean and interfering with fish and marine mammals, such as endangered species of whales (and perhaps triggering the sanctions in the U.S. Marine Mammal Protection Act of 1972).¹²¹ Envi-

allows the United States to enter into "reciprocating State's agreements" (RSAs) with only those countries which have and utilize comparable environmental standards. *Id.*

117. See Declaration on the Establishment of a New International Economic Order, G.A. Res. 3201, S-6 U.N. GAOR Supp. (No. 1) at 3, U.N. Doc. A/9559 (1974). For a discussion of the impact of the New Economic Order on UNCLOS III, see Kindt, *The Effect of Claims by Developing Countries On LOS International Marine Pollution Negotiations*, 20 VA. J. INT'L L. 313 (1980) [hereinafter *Effect of Claims*].

118. The Stockholm Conference was held in Stockholm from June 5-16, 1972. See Report of the United Nations Conference on the Human Environment, U.N. Doc. A/CONF.48/14/Rev.1 (revised ed. 1972).

119. See generally, *Effect of Claims*, *supra* note 117.

120. See *Transboundary Pollution*, *supra* note 6, at 587-88.

121. 16 U.S.C. §§ 1361-1407 (1982 & Supp. III 1985).

ronmentalists may become further incensed by visions of these plumes destroying oxygen-producing phytoplankton which are made more important because of the worldwide deforestation problem. Without adequate environmental safeguards in place when deep seabed mining does become economical, the industry could be faced with unexpected and formidable opposition from environmentalists throughout the world.

Compounding this problem facing the deep seabed mining industry is the "nexus factor." When viewing worldwide or transboundary pollution problems, an industry can often point to the lack of a nexus between the alleged pollution and the alleged injury.¹²² For example, despite the apparent eight percent decrease during the 1980s in the world's ozone layer¹²³ accompanied by ozone holes over Antarctica,¹²⁴ Switzerland,¹²⁵ and northern Europe,¹²⁶ the manufacturers of chlorofluorocarbons (CFCs) can claim that there is no scientific proof definitely connecting the industry-produced CFCs to the depletions in the ozone layer—although each chlorine atom released from a CFC molecule destroys 100,000 ozone molecules.¹²⁷ Similarly, in the problem area of acid rain it is difficult, if not impossible, to demonstrate that one company's (or country's) pollution is the cause-in-fact of a specific environmental injury.¹²⁸

These claims of uncertainty will not be available to deep seabed mining operations. There will be no question of nexus. The specific countries and consortia interested in deep seabed mining are well-known. When the *first* deep seabed mining begins, the generators of the pollution will be known, the impacts of the pollution will gener-

122. *Transboundary Pollution*, *supra* note 6, at 592.

123. Bowman, *Global Trends in Total Ozone*, 239 SCI. 48, 48 (1988). For comments concerning the serious consequences of ozone depletion, see *Ozone Depletion, the Greenhouse Effect, and Climatic Change: Hearings Before the Subcomm. on Environmental Pollution of the Senate Comm. on Environment and Public Works*, 99th Cong., 2d Sess. 155, 157 (1986).

124. NATIONAL AERONAUTICS & SPACE ADMIN., PRESENT STATE OF KNOWLEDGE OF THE UPPER ATMOSPHERE: AN ASSESSMENT REPORT 105-07 (1986); see Solomon, Garcia, Rowland, & Wuebbles, *On the Depletion of Antarctic Ozone*, 321 NATURE 755 (June 1986).

125. In 1987, ground stations reported what appeared to be an ozone hole over Switzerland, but this observation requires further confirmation.

126. *Ozone 'Hole' Found Over Europe*, NEW SCIENTIST, Oct. 16, 1986, at 21; Weisburd, *One Ozone Hole Returns, Another is Found*, 130 SCI. NEWS 215, 215 (Oct. 4, 1986).

127. Lemonick, *The Heat is On: Chemical Wastes Spewed into the Air Threaten the Earth's Climate*, TIME, Oct. 19, 1987, at 58, 62 (quoting F.S. Rowland).

128. *Transboundary Pollution*, *supra* note 6, at 592.

ally be calculable, and the nexus should be relatively easy to establish. This situation should encourage the deep seabed mining industry to exercise caution, to internalize the externalities (*i.e.*, pay the environmental costs),¹²⁹ and to incorporate adequate environmental safeguards into their plans for exploiting manganese nodules and other marine minerals.

Reasonable and responsible exploitation of nonliving ocean resources is quite acceptable to most of the international environmental community, as long as there are adequate environmental safeguards. Given these considerations and the nexus factor, the deep seabed mining industry should be proportionately more careful than some other industries have been. The *sua sponte* incorporation of adequate environmental safeguards by the deep seabed mining industry, combined with the industry's encouragement that such safeguards be adopted in both domestic and international fora, could coalesce the international environmental community as a political force behind the deep seabed mining industry as a whole, or behind a responsible segment of that industry (including a single country or countries).

Within this context, it is not ethnocentric to suggest that the U.S. environmental safeguards suggested by NOAA be utilized as a model for the beginning stages of adopting an eventual environmental regime. Support should be generated for NOAA's principle of establishing "stable reference areas," as modified by the concepts of "impact reference areas," "preservational reference areas,"¹³⁰ and spot-checks. While the process may appear to be progressing slowly, NOAA's progress in establishing environmental regulations parallels the distant prospects for the initiation of actual deep seabed mining activities.

On the international level, any initiatives to improve the environmental safeguards associated with deep seabed mining should only occur as part of a renegotiation of a regime for the deep seabed, which "is indispensable to agreement and bringing into force an effective, comprehensive Convention on the Law of the Sea."¹³¹ Objections to such a renegotiation have come from countries who achieved gains and "certainty" under Part XI of the LOS Convention.¹³² However, "certainty purchased at the price of a system that

129. *Id.* at 587.

130. 52 Fed. Reg. 34,750 (1987).

131. Law Panel, *supra* note 105, at 6.

132. *Id.*

is out of date before it is implemented would have little value.”¹³³ This observation by the Panel on the Law of Ocean Uses is particularly valid with regard to any environmental regime, which must necessarily follow and accommodate new scientific data and changing technologies (including the “best available technology”¹³⁴ for protecting the environment). Accordingly, the international community should redouble its efforts to negotiate a regime for deep seabed mining that:

- a. “clarifies institutional and procedural details . . . and identifies specific criteria to serve as a basis for decision-making,”¹³⁵
- b. “eliminates detailed provisions that are or will soon be outdated,”¹³⁶ and
- c. “defers consideration of detailed implementing regulations on matters that are subject to economic and industrial developments [including environmental safeguards] until there is real interest in beginning deep seabed mining.”¹³⁷

A *sine qua non* of the “common heritage of mankind”¹³⁸ is the environmental protection of that heritage.¹³⁹ Regardless of the various issues and the concomitant disagreements involving deep seabed mining, the marine environment must have adequate safeguards to benefit and protect all of Mankind.

133. *Id.*

134. *See* 52 Fed. Reg. 34,750 (1987).

135. Law Panel, *supra* note 105, at 6.

136. *Id.*

137. *Id.*

138. *See* 22 U.N. GAOR, C.1 (1515th mtg.) 1, U.N. Doc. A/C.1/PV.1515 (1967) (speech of Maltese Ambassador Arvid Pardo); U.N. Doc. A/6695 (1967); *see also* U.N. Doc. A/AC.135/1 at 27 (1967).

139. *See, e.g.,* MARINE POLLUTION, *supra* note 2, at 42, 154, 203.