

SAVE THE MUCKWORMS!

ENVIRONMENTAL PROTECTION IN THE 1994 AGREEMENT RELATING
TO THE IMPLEMENTATION OF PART XI OF THE UNITED NATIONS
CONVENTION ON THE LAW OF THE SEA

By
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I. INTRODUCTION

In the early 1980s, the most controversial aspect of the third United Nations Convention on the Law of the Sea (UNCLOS III)¹ was Part XI, the section regulating deep seabed mining. Negotiated in an international political climate dominated by the Group of 77 (G-77)² and in the spirit of the new international economic order between 1973 and 1982, Part XI contains provisions requiring mandatory technology transfers to developing countries, centralized planning mechanisms, and an almost communist profit-sharing scheme.³ Unsurprisingly, the United States, and other industrialized nations with it, strenuously objected to such provisions and refused to sign the treaty.⁴

Without the participation and endorsement of the industrialized world, it took twelve years to obtain the sixty ratifications necessary for the treaty to become law.⁵ The United Nations (UN) reopened negotiations to reach an agreement on the deep-sea mining issue that would allow worldwide participation in and adherence to the convention.⁶ In 1994, the nations signed the Agreement

¹ *United Nations Convention on the Law of the Sea*, opened for signature Dec. 10, 1982, Preamble, UN Doc. A/CONF.62/122 (1982) reprinted in 21 I.L.M. 1261 (1982) [hereinafter UNCLOS]. The first two conventions were held in Geneva in 1958 and 1960. *See id.*

² *See* JOAN E. SPERO & JEFFREY A. HART, *THE POLITICS OF INTERNATIONAL ECONOMIC RELATIONS* 162-63 (5th ed. 1997). The Group of 77 (G-77) consisted of underdeveloped countries, primarily from the Southern Hemisphere, that banded together in the United Nations (UN) to increase their influence and clout, and resist the domination of industrialized nations represented in the Group of 7. *See id.* At the height of the G-77's influence, they introduced a concept known as the New International Economic Order (NIEO). *See id.* The NIEO included greater northern commitment to aid and transfers of wealth and technology, as well as greater control of multinational corporations. *See id.* Northern nations overwhelmingly rejected the G-77's proposals. *See id.* However, their influence was greatest in UN conferences where their vote was equal to those of industrialized nations. *See id.*

³ *See* A. BERNAERTS, *BERNAERTS' GUIDE TO THE LAW OF THE SEA: THE 1982 UNITED NATIONS CONVENTION* 12 (1988); W.S. BURKE & F.S. BROKAW, *Ideology and the Law of the Sea*, in *U.S. POLICY DILEMMA* 48 (B.H. OXMAN et al. eds., 1983).

⁴ *See* President Ronald Reagan, *U.S. Policy and the Law of the Sea* (Jan. 29, 1982), in DEP'T ST. BULL., Mar. 1982, at 54; *see also* John Alton Duff, *UNCLOS and the New Deep Seabed Mining Regime: The Risks of Refuting the Treaty*, 19 SUFFOLK TRANSNAT'L L. REV. 1, 11-12 (1995) (quoting President Reagan stating that those voting no or abstaining "represented countries which produce more than 60% of the world's gross national product and provide more than 60% of the contributions to the United Nations"); Dick Russell, *Deep Blues: The Lowdown on Deep-sea Mining*, AMICUS J., Winter 1998, at 29 (noting that "the United States refused to endorse the final text; other developed nations followed suit").

⁵ *See* Russell, *supra* note 4, at 29.

⁶ *See* E.D. BROWN, *Neither Necessary nor Prudent at this Stage: The Regime of Seabed Mining and its Impact on the Universality of the UN Convention on the Law of the Sea*, MARINE POL'Y, Mar. 1993, at 81, 81.

Relating to the Implementation of Part XI⁷ (Agreement), thus removing objections to the Law of the Sea's seabed mining regime and facilitating the entry of the industrialized world into the treaty's scope.⁸ For the most part, the political problems surrounding the mining issue have been solved.⁹

The "solution" to the mining regime debate has once again piqued the interest of the mining industry.¹⁰ Given the opportunity to profit handsomely from deep seabed mining, exploration is once again underway.¹¹ Indeed, due to advances in knowledge of the seabed and in mining technology, deep-sea mining is an imminent reality.¹²

Given this technological advancement, new objections and questions are being raised, which are no longer political, but environmental.¹³ Since the original negotiations on Part XI occurred during the 1970s, scientists have discovered abundant life on the sea floor, shattering the notion of a deep ocean azootic, or lifeless, zone.¹⁴ Many new species of fish, worms, clams, anemones, and bacteria are discovered almost daily on the deep ocean's varied topography.¹⁵ Many of these species are extremely specialized, having adapted to life on a particular sea-mound, burrow or chimney.¹⁶

⁷ *Agreement Relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982*, adopted 28 July 1994, entered into force 28 July 1996, G.A. Res. 48/263, reprinted in 33 I.L.M. 1309 (1994) [hereinafter *Agreement*].

⁸ See U.S. Department of State, *Fact Sheet: U.S. Oceans Policy and the Law of the Sea Convention*, 7 U.S. DEP'T OF STATE DISPATCH 108 (1996).

⁹ See Russell, *supra* note 4, at 29.

¹⁰ See Russell, *supra* note 4, at 25 (noting "the quiet revival of interest in mining the deep-sea floor").

¹¹ See INTERNATIONAL SEABED AUTHORITY, PRESS RELEASE 2 (6th Session, Kingston, Jamaica, 3-14 July 2000 (SB/6/27)) [hereinafter *PRESS RELEASE*] (quoting Secretary-General of the International Seabed Authority, Satya N. Nandan, that "[t]he Authority could now issue contracts to the seven pioneer investors that had presented their plans of work to the Council in 1997"). See *International Seabed Authority* (visited Nov. 12, 2000) <<http://www.isa.org.jm/>>. These pioneer investors include France, Japan, the Russian Federation, India, China, Korea, and an Eastern European consortium. See *The Convention on the Law of the Sea, Oceans Conference, Monterey, California* (visited Nov. 12, 2000) <http://www.state.gov/www/global/oes/oceans/980610_los.html> [hereinafter *Oceans Conference*].

¹² See Conrad G. Welling, *Mining of the Deep Seabed in the Year 2010*, 45 LA. L. REV. 1249, 1249 (stating that "the resource is there and will be mined eventually," and more specifically that "[g]iven the time scale of exploration tool development and other exceptions . . . the time scale for ocean mining is a reasonable two thousand to two thousand and ten A.D. period").

¹³ See, e.g., Stephanie Pain, *Mud, Glorious Mud*, NEW SCIENTIST supp. (Nov. 4, 1996); Peter A. Rona, *Metal Factories of the Deep Sea*, NAT. HIST. (Jan. 1998); Russell, *supra* note 4, at 29.

¹⁴ See Pain, *supra* note 13. See generally Margaret K. Tivey, *Hydrothermal Vent Systems*, OCEANUS, Winter 1991-92.

¹⁵ See generally Pain, *supra* note 13.

¹⁶ See *id.*; see also Russell, *supra* note 4, at 27.

This extreme specificity results in high species variation, and a rich collection of biodiversity, perhaps as diverse as the Amazon rainforests.¹⁷ The unique nature of deep-water organisms makes them potentially attractive to scientists, interested in pure science, and to pharmaceuticals and biotechnology industries, interested in material and financial benefits.¹⁸ Scientists and environmentalists alike fear that because most political and economic roadblocks have been removed, deep-sea mining will charge ahead, ruining these fragile ecosystems in the process.¹⁹ The potential uses of deep-sea organisms in medicine, bioremediation, and other biotechnology industries may never be realized. Indeed, it is unclear whether the loss of genetic diversity will outweigh any loss in mineral revenues.

As stated earlier, the political and economic problems of Part XI of UNCLOS III have been "solved" in the sense that consensus has been achieved. Now, however, it is time to analyze the *environmental* implications of the deep seabed mining regime. Despite the weakness of the environmental provisions in the Agreement, it does grant the International Seabed Authority (Authority), the entity responsible for regulating seabed mining, the power to include environmental safeguards in the prospecting application process. Indeed, in July 2000, the Authority issued the Regulations on Prospecting and Exploration for Polymetallic Nodules, which govern the application process and contain several environmental protection provisions. This Article argues that with a strengthened environmental assessment, environmentalists, scientists, and mining interests can reach a common ground.

Part II of this Article describes the original seabed provisions of Part XI of UNCLOS III, as well as the industrialized nations objections. Part II also discusses the new look of the seabed mining regime embodied in the 1994 Agreement. Part III describes the wealth of the oceans, both mineral and living. Part IV identifies the threats to deep-sea life, and the importance of deep-sea organisms to the biotechnology and pharmaceutical industries. Part V covers the environmental provisions in the seabed mining regime. Finally, Part VI contains proposals for strengthening the environmental protection in the mining regime.

¹⁷ See Russell, *supra* note 4, at 27.

¹⁸ See *id.* at 28.

¹⁹ See Russell, *supra* note 4, at 28 (quoting William J. Broad as saying, "the ominous question . . . is not whether seabed mining will kill sea creatures but how great the carnage will be"). See generally Pain, *supra* note 13, at 5.

II. EVOLUTION OF THE SEA BED MINING REGIME:
PART XI AND THE 1994 AGREEMENT

Mining seabed minerals was not at first thought to be an economically profitable exercise.²⁰ During the 1960s, U.S. Steel dredged a few tons of manganese nodules from the ocean floor and gave them to refineries and smelters. They asked scientists whether it would be profitable to extract minerals from them.²¹ U.S. Steel abandoned its seabed activities when the answer was a unanimous "no."²² Deep seabed mining is, after all, "an enormous challenge that has been compared to standing atop a New York City skyscraper on a windy day, trying to suck up marbles off the street below with a vacuum cleaner attached to a long hose."²³

With the advent of new technologies, however, many of the participants of the UNCLOSIII believed that work on deep seabed mining would soon commence.²⁴ Deep seabed mining had the potential to be enormously profitable. Indeed, deposits of polymetallic nodules are scattered over large areas of the Pacific and Atlantic Oceans.²⁵ These nodules contain nickel, copper, manganese, and cobalt.²⁶ Cobalt is vitally important to the production of jet engines and nuclear propulsion systems.²⁷ At present, the major U.S. suppliers of cobalt are Zambia, Democratic Republic of the Congo, and the former U.S.S.R.²⁸ Because deep seabed mining held the promise of a new source of revenue for both industrialized and developing nations, potential competition and conflict necessitated a detailed international deep seabed mining regime.

Industrialized and developing countries approached these negotiations from two different points of view. Industrialized nations claimed that because the

²⁰ MARKUS G. SCHMIDT, COMMON HERITAGE OR COMMON BURDEN?: THE UNITED STATES POSITION ON THE DEVELOPMENT OF A REGIME FOR DEEP SEABED MINING IN THE LAW OF THE SEA CONVENTION 19 (1989).

²¹ *See id.*

²² *See id.*

²³ *United Nations Convention on the Law of the Sea: Key Provisions of the Convention* (visited June 3, 1998) <[http://www.un.org/Depts/los/unitedna.htm#Deep Seabed Mining](http://www.un.org/Depts/los/unitedna.htm#Deep%20Seabed%20Mining)>.

²⁴ *See* BERNAERTS, *supra* note 3, at 121; Duff, *supra* note 4, at 5; Keith Suter, *The New Law of the Sea*, *CONTEMP. REV.*, July 1995, at 7, 10.

²⁵ *See* Russell, *supra* note 4, at 25-26.

²⁶ Burke, *supra* note 3, at 54.

²⁷ *See id.*

²⁸ *See id.*

seabed belonged to no one, anyone could exploit its resources.²⁹ Developing countries, on the other hand, asserted that the seabed belonged to everyone, and everyone should enjoy the benefits of its exploitation.³⁰ Working as the G-77, developing countries tried to keep deep seabed mining linked to other important issues in UNCLOSIII, giving them a much stronger bargaining position.³¹ These issues include the extent of national territorial seas and economic zones, rights of commercial and military navigation, fishing rights, offshore hydrocarbon development, continental shelves, natural and artificial islands, straits passage, archipelagos, marine environmental protection, and peaceful dispute settlement procedures.³² Because "Third World agreement was required for the convention to become effective, Western negotiators were strongly influenced to make concessions to states whose only negotiating asset was the formal right to assent or reject the treaty."³³ Given their numeric majority, the G-77 emerged from the negotiations victorious.

A. *The Seabed Mining Regime in Part XI*

Part XI of the treaty contains provisions that commentators in the industrialized world considered almost "Orwellian" in nature.³⁴ During negotiations, the Third World argued that the mining regime "should be a democratic institution responsible for bridging the gap between the rich countries and the poor countries and establishing a fairer and more just system of international relations."³⁵ The communitarian flavor of the mining regime was clearly expressed in Article 136, stating that the seabed "and its resources are the common heritage of mankind."³⁶ More explicitly, Article 140 provides "for the equitable sharing of financial and other economic benefits derived from" seabed mining.³⁷

²⁹ See Burke, *supra* note 3, at 48.

³⁰ See *id.*

³¹ See G. GALDORISI ET AL., *THE UNITED STATES AND THE 1982 LAW OF THE SEA CONVENTION: THE CASES PRO AND CON* 17 (1994).

³² L.N. Antrim and J.K. Sebenius, *Incentives for Ocean Mining Under the Convention*, in *LAW OF THE SEA: US POLICY DILEMMA* 81 (B.H. Oxman et al. eds., 1983); GALDORISI, *supra* note 31, at 17.

³³ Burke, *supra* note 3, at 49.

³⁴ GALDORISI, *supra* note 31, at 75.

³⁵ Burke, *supra* note 3, at 47.

³⁶ See UNCLOS, *supra* note 1, art. 136.

³⁷ See *id.* art. 140.

The treaty also envisioned substantial UN involvement in the mining process. For example, according to the provisions of the treaty, all activities in the mining area are to be “organized, carried out, and controlled by the Seabed Authority.”³⁸ The driving policies of the Authority include:

a) responsible conduct in the Area and on the world’s mineral markets, b) acquisition and transfer of technology, c) raising and use of all kinds of revenues from activities in the Area, d) enhancement of opportunities for activities for all states, and e) taking at each step the interests and needs of particular states or particular groups of states into consideration.³⁹

Further, “the Authority must adhere to a detailed production policy for polymetallic nodules, which is to be calculated on the basis of the projected world nickel consumption” in order to cushion the impact of increased supply on land-based mineral producers.⁴⁰ The treaty also stated that the Authority “may implement compensation schemes or take economic measures for developing countries which might suffer adverse effects as a result of the production policy issued.”⁴¹

Part XI also created a complicated bureaucracy to administer its provisions. The International Seabed Authority is the government of the seabed; specifically, it “is the organization through which States Parties shall . . . organize and control activities in the Area, particularly with a view to administering the resources of the Area.”⁴²

The Assembly may be thought of as the “legislative branch” of the Authority.⁴³ It is made up of all members of the Authority, and is responsible for developing the policies of the Authority.⁴⁴ It also is responsible for establishing subsidiary bodies, assessing contributions from members, and considering and approving rules, regulations and procedures.⁴⁵

³⁸ BERNAERTS, *supra* note 3, at 56.

³⁹ *Id.*

⁴⁰ *Id.*

⁴¹ *Id.*

⁴² See UNCLOS, *supra* note 1, art. 157.

⁴³ See *id.* art. 160.

⁴⁴ See *id.*

⁴⁵ See *id.*

The administrative arm of the authority is the Secretariat, comprised of the Secretary-General and Authority staff.⁴⁶ The Enterprise is the operative body of the Authority.⁴⁷ It is essentially a mining company operated by the Authority "for the benefit of mankind."⁴⁸ Specifically, the Enterprise is responsible for "transporting, processing and marketing" the minerals found on the seabed, as well as "receiving" mining technology from contractors.⁴⁹

Finally, the Council is the executive body of the International Seabed Authority.⁵⁰ It establishes the specific policies of the Authority, and is charged with supervising and implementing the provisions of Part XI.⁵¹ The Council itself has two subsidiary bodies: the Economic Planning Commission and the Legal and Technical Commission.⁵² The Economic Planning Commission is responsible for analyzing trends affecting the minerals industry and for proposing a system of compensation for nations negatively impacted by seabed mining.⁵³ The Legal and Technical Commission (the Commission), on the other hand, reviews work plans to evaluate their impacts on the environment, and to monitor the compliance with rules, regulations and procedures.⁵⁴ The Commission is the most important body for the purposes of this article.

B. Objections to Part XI

This arrangement, however, was unacceptable to the North, especially the United States. On July 9, 1982, President Reagan announced that the United States would not sign the convention, arguing that "the U.S. was paying dear with seabeds for something cheap like navigation rights."⁵⁵

⁴⁶ See *id.* art. 166.

⁴⁷ See *id.* art. 170.

⁴⁸ See *id.* art. 140; see also Brown, *supra* note 6, at 83.

⁴⁹ See UNCLOS, *supra* note 1, at art. 170; see also Brown, *supra* note 6, at 84.

⁵⁰ See UNCLOS, *supra* note 1, art. 162.

⁵¹ See *id.*

⁵² See *id.* art. 163.

⁵³ See *id.* art. 164.

⁵⁴ See *id.* art. 165.

⁵⁵ BERNAERTS, *supra* note 3, at 12; see also GALDORISI, *supra* note 31, at 27. It is interesting to note, however, that roughly 95% of known ocean resources occur within two hundred miles from the world's coastlines. Welling, *supra* note 12, at 1263. Since they are within two hundred miles of the coasts, the vast majority of minerals are found within Exclusive Economic Zones (EEZs), and are therefore subject to national, not international, jurisdiction. See *id.*

Industrialized nations refused to sign the treaty because of ideological objections to provisions of Part XI that provide disincentives to mine, mandate technology transfers and authorize international taxation.⁵⁶ One objection, for example, was to the “site-banking” provision of Part XI that requires applicants for mining permits to designate an area large enough to allow two mining operations.⁵⁷ The Authority may then claim either of the two sites for the Enterprise, or a developing nation.⁵⁸ Another provision of the treaty places an obligation on contractors to transfer technology to the Enterprise.⁵⁹

Part XI also imposes tremendous financial burdens on potential mining operations. For example, the treaty provides that the Authority may levy taxes on mining companies.⁶⁰ Specifically, the treaty states that some of the “funds necessary for operation are to come from activities in the Area, i.e., from royalties paid by operators in the Area, from payments by the Enterprise, or from coastal states for exploration of the outer shelf.”⁶¹ Specifically, “miners will also have to pay their overseer, the Authority, and competitor, the Enterprise: \$500,000 to apply, \$1 million annually, plus a royalty fee.”⁶² The royalty fees are “equal to 2% of gross revenues and 35% of any mining profits. For projects that are extremely successful, payments include a 4% royalty and a 70% share of the marginal profit dollar from mining operations during later years of the operation.”⁶³ These objections to Part XI threatened international consensus on the Law of the Sea, therefore obviating the need for further compromise.

⁵⁶ See Brown, *supra* note 6, at 82-83.

⁵⁷ See Brown, *supra* note 6, at 83-84.

⁵⁸ See *id.*

⁵⁹ *Id.*

⁶⁰ Burke, *supra* note 3, at 52.

⁶¹ BERNAERTS, *supra* note 3, at 58. See also UNCLOS, *supra* note 1, art. 82; 171(b); 171(c); Annex III, art. 13; Annex IV, art. 10.

⁶² GALDORISI, *supra* note 31, at 76.

⁶³ Burke, *supra* note 3, at 88.

C. The 1994 Agreement

Changes in the international political and economic climate provided the impetus for a re-negotiation of Part XI. Secretary-General Perez de Cuellar commented that

The present situation in which there is the unprecedented number of 159 signatories to the Convention, but only 51 ratifications and accessions — all but one from developing countries — is highly unsatisfactory. There is a real possibility that such a situation could lead to the erosion of the delicate balance contained in the Convention.⁶⁴

The UN Resolution on the Law of the Sea by the General Assembly on December 12, 1991 later called “upon all states to take appropriate steps to promote universal participation in the Convention ... through dialogue aimed at addressing the issues of concern to some states.”⁶⁵ This call for re-negotiation resulted in the Agreement Relating to the Implementation of Part XI of the 1982 United Nations Convention on the Law of the Sea (Agreement), which was adopted and opened for signature at the UN in New York on July 29, 1994. The stated purpose of the Agreement was to remove the objectionable language contained in Part XI and to reflect the political and economic changes that have taken place since 1982.⁶⁶

In general, the newly negotiated Agreement was very favorable to the United States and other industrialized nations.⁶⁷ Specifically, the parties agreed that “it would be neither necessary nor prudent at this stage” to establish detailed production policies, to develop a system of assistance to land-based producers, or to develop a system of taxation.⁶⁸ The Agreement also removes the objectionable mandatory transfer of technology provisions, and replaces Part XI’s interventionist economic planning approach with provisions to ensure that market-oriented approaches are used in the management of resources of the deep sea-

⁶⁴ Brown, *supra* note 6, at 81.

⁶⁵ *Id.* at 81-82.

⁶⁶ *Id.* at 99. The preamble of the *Agreement*, for example, states that the parties, “not[e] the political and economic changes, including market-oriented approaches, affecting the implementation of Part XI.” See *Agreement*, *supra* note 7, preamble.

⁶⁷ See *Oceans Conference*, *supra* note 11, at 2.

⁶⁸ See Brown, *supra* note 6, at 102.

bed.⁶⁹ It also reduces the size of institutions and links their activation and operation to the development of concrete interest in deep seabed mining.⁷⁰ Perhaps most importantly, the new Agreement guarantees the United States a seat on the Council, which makes most of the substantive decisions of the Authority, and allows it, with at least two other industrialized nations, to veto any decisions of the Council.⁷¹ Thus, the northern countries' concerns appear to be solved.

III. DEEP-SEA WEALTH

A. Mineral Wealth of the Deep Sea

Another impetus for the political negotiations discussed above were, of course, new discoveries of significant sources of mineral wealth on the sea floor. By 1974, for example, "it was well established that a broad belt of sea floor between Mexico and Hawaii and a few degrees north of the equator (the so-called Clarion Clipperton zone) was literally paved with nodules over an area of more than 1.35 million square miles."⁷² More recent discoveries of deep-sea vents and "smoker chimneys" have also revealed a significant source of mineral wealth, as they are rich in valuable minerals such as zinc, copper, silver, and gold.⁷³ One group of chimneys near the Galapagos Islands, for example, are estimated to contain \$2 billion worth of copper alone.⁷⁴

Several nations have already taken the first steps toward the development of seabed mining operations.⁷⁵ Japan and Germany, neither of which possess domestic mineral wealth, have expressed much interest in exploration.⁷⁶ South Korea and China have already begun exploration in the Pacific.⁷⁷ Saudi Arabia and the Sudan are conducting feasibility tests for mining the wealth of chimneys

⁶⁹ See *id.* at 101; *Oceans Conference*, *supra* note 11, at 2.

⁷⁰ *Id.* at 100. Section 1(3) of the Annex to the Agreement states that the "setting up and the functioning of the organs and subsidiary bodies of the authority shall be based on an evolutionary approach." See Agreement, *supra* note 7, Annex, § 1(3).

⁷¹ See *Oceans Conference*, *supra* note 11, at 2. See also Agreement, *supra* note 7, Annex, § 3(15)(a).

⁷² See Russell, *supra* note 4, at 26.

⁷³ See Rona, *supra* note 13, at 53.

⁷⁴ See Russell, *supra* note 4, at 26.

⁷⁵ *Id.*

⁷⁶ *Id.*

⁷⁷ *Id.*

located at the bottom of the Red Sea.⁷⁸ In September 1998, the International Seabed Authority approved work plans from several "pioneer investors."⁷⁹ These investors come from nations as diverse as India, France, Japan, Russia, and China.⁸⁰

Technology, while still not completely developed, is improving. According to Conrad Welling, Senior Vice-President of Ocean Mineral Company, "there is no known technology barrier preventing the development of a commercial deep ocean mining system."⁸¹ Indeed, Ocean Management Inc. is currently developing "tractor-like devices for scooping large quantities of minerals off the sea floor and hoisting them back to the surface for at-sea processing."⁸² Without a doubt, the future of deep-sea mining is rapidly moving forward. The political problems with the Law of the Sea have been worked out, and the will, demand and investment dollars are all present. According to John Flipse, a retired professor and ocean-prospecting pioneer, "ocean mining is going to work. The feasibility has been demonstrated. Ultimately, it's the sea or metal substitution."⁸³

B. Deep-Sea Life

Political and technological developments in seabed mining have been more than amply matched by recent discoveries of life on the ocean's benthic communities. Thousands of meters below the surface, abyssal plains are relatively unaffected by storms, swift currents, or other forms of turbulence.⁸⁴ With such erosive powers absent in these deep sea "deserts," very specialized forms of life have developed in tiny niches, crevices and borrows.⁸⁵ For example, there are some organisms that subsist solely on terrestrial wood that has slowly worked its way down to the ocean floor.⁸⁶ There is another species that creates spiral burrows which "encourage the growth of manganese-oxidizing bacteria, perhaps a food

⁷⁸ See Rona, *supra* note 13, at 54.

⁷⁹ See Russell, *supra* note 4, at 29.

⁸⁰ See *id.*

⁸¹ See Welling, *supra* note 12, at 1262.

⁸² Russell, *supra* note 4, at 26.

⁸³ *Id.* at 29.

⁸⁴ See Russell, *supra* note 4, at 27-28 (noting the lack of storms, and describing seabed as "undisturbed and stable"). *But see* Pain, *supra* note 13, at 7. This disagreement highlights the current state of scientific understanding of the seabed.

⁸⁵ See Russell, *supra* note 4, at 27.

⁸⁶ See *id.*

source.⁸⁷ Samples taken from the mud on the ocean bottom have retrieved at least one new species in each square foot of mud.⁸⁸ These invertebrate animals include polychaetes, sipunculids, and tanaids though many still await classification.⁸⁹

Even more exciting, and bizarre, are discoveries of the variety of life surrounding deep-sea vents. It is surprising that life is found in these vents and chimneys that create such incredibly harsh environments. Like volcanoes, deep-sea vents (the result of geothermal activity deep within the Earth) form enormous mounds. One such mound was described as being "about the size and shape of the Houston Astrodome."⁹⁰ On top of these mounds are chimney-like structures reaching as high as 75 feet.⁹¹ Despite their imposing height, the chimneys are quite fragile formations that "vary in thickness from 5 inches to as little as .25 of an inch."⁹² Heated by magma from deep within the Earth, the mineral-rich water spewing from these chimneys may reach temperatures ranging from 350–700 degrees Celsius.⁹³

Not only is this sulfur-laden water extremely hot, but it also contains a toxic cocktail of metals and minerals.⁹⁴ Another factor in the harshness of this environment is its extreme depth ranging from 2000 to 4000 meters below the surface.⁹⁵ At these depths, pressure can reach as high as 400 bars, and sunlight, the vital ingredient in the process of photosynthesis, cannot penetrate to the bottom.⁹⁶

Despite these seemingly inhospitable conditions, researchers have discovered life in abundance in areas immediately surrounding the chimneys. Instead of light and photosynthesis as a base for life, the food chain in vent communities "is supported by bacteria that draw their nourishment from chemicals dissolved from the rocks by the water venting in the hot springs."⁹⁷ This bacteria feeds anemones, sponges, crabs, tube worms, fish, mussels, and other unidentified

⁸⁷ *Id.*

⁸⁸ *See id.*

⁸⁹ *See id.*

⁹⁰ Rona, *supra* note 13, at 52.

⁹¹ *See id.*

⁹² Tivey, *supra* note 14, at 68-69; *see also* Rona, *supra* note 13, at 88; Suter, *supra* note 24, at 8.

⁹³ *See id.* at 69; Russell, *supra* note 4, at 27.

⁹⁴ *See* Russell, *supra* note 4, at 28

⁹⁵ *See id.* at 69.

⁹⁶ *See id.*

⁹⁷ Rona, *supra* note 13, at 52.

animals.⁹⁸ During a visit to one vent community in the mid-Atlantic Ridge, Peter Rona described the abundant life he witnessed:

Clumps of bacteria drifted like snowflakes. Looking like daisies sprouting from a field of red soil, white anemones, with tentacles several inches long, were scattered on the rocks. White crabs crawled in and out of rock crevices.⁹⁹

Obviously, these discoveries of abundant life have shattered the old notion of ocean deserts.

IV. THE THREAT OF SEABED MINING

Because deep seabed mining is still in the developmental stage, its environmental impacts are uncertain. However, a few educated guesses can be made. For example, deep-sea mining is not likely to be a precision process. After all, as noted earlier, current proposals for mining technologies include the use of a "tractor-like device" to collect manganese nodules.¹⁰⁰ Those benthic species laying in dredging paths are almost certain to be destroyed. According to William J. Broad, the question "is not whether seabed mining will kill sea creatures but how great the carnage will be."¹⁰¹ For example, the plume effect of disturbed sediments, and possible releases of toxic chemicals that will result from the mining process, are unknown. Sylvia Earle argues that mining of manganese nodules

can release into the surrounding seawater chemicals or substances that have been stabilized over the ages. Some of these metals are toxic to many creatures, but favored by others that prosper in the presence of the compounds. Their extraction could have widespread downstream impact.¹⁰²

Scientists are simply unsure as to the effect deep seabed mining will have.

Compounding the likely environmental impact of the mining process itself is the extreme fragility of deep-sea ecosystems. For example, smoker chimneys are only inches thick.¹⁰³ Commenting on this fragility, one research team

⁹⁸ See Russell, *supra* note 4, at 27. For a detailed list of organisms and locations see Richard A. Lutz, *The Biology of Deep-Sea Vents and Seeps: Alvin's Magical Mystery Tour*, OCEANUS (Winter 1991-92) at 75, 75-83.

⁹⁹ Rona, *supra* note 13, at 52.

¹⁰⁰ Russell, *supra* note 4, at 26.

¹⁰¹ *Id.* at 28.

¹⁰² *Id.*

¹⁰³ See Tivey, *supra* note 14, at 68.

observed, “[a]s we hit the chimney with the leading edge of a sample basket mounted at the front of the submersible, the chimney broke and fragments glittering with metallic crystals fell into the basket.”¹⁰⁴ Harvesting minerals from vent communities, it seems, may well wreak the same havoc that clear cutting does in forest ecosystems.

A related problem is that many of the deep-sea species are very specific to their particular habitats. Organisms found in one vent community may differ greatly from organisms found in another vent community. Indeed, “every hydrothermal vent field examined to date has some species that are not found in any other vent field.”¹⁰⁵ Also significant is the fact that life on the ocean floor happens at a very slow pace. For example, *Tindaria callistiformis*, an abyssal clam, takes 100 years to grow to the length of one third of one inch.¹⁰⁶ According to Elliot Norse, founder of the Marine Conservation Biology Institute in Seattle, “[s]low growth rates and the sluggish reproduction that accompanies this might make deep-sea ecosystems especially slow to recover even after stresses have been removed.”¹⁰⁷ Thus, the clumsy art of mining may potentially inflict considerable injury on these deep-sea ecosystems.

A. Importance of Deep-Sea Organisms

Why would we care if a few worms and crabs were killed in a process that will reap billions of dollars in profits? Casting aside the argument that all life has an intrinsic value, there are several sound environmental, biological, and even economic reasons for preserving deep-sea ecosystems. The first is that these ecosystems contain incredible biodiversity. Fred Gassle, working for the U.S. Minerals Management Service, argues that “[a]t present, it is not possible to get a good estimate of the number of species in the deep sea. But there’s got to be at least a million and 10 million is not unreasonable.”¹⁰⁸ In his opinion, the deep sea may contain as much genetic diversity as the media popularized tropical rain forests.¹⁰⁹

¹⁰⁴ Rona, *supra* note 13, at 54.

¹⁰⁵ Russell, *supra* note 4, at 27.

¹⁰⁶ *See id.* at 28.

¹⁰⁷ *Id.*

¹⁰⁸ Pain, *supra* note 13, at 6.

¹⁰⁹ *See* Russell, *supra* note 4, at 27.

Unfortunately, there are few people working to identify and classify these new discoveries.¹¹⁰ Indeed, there are only a handful of people in the world trained to identify cirratulid worms and tanaids found on the ocean floor.¹¹¹ According to Dr. Lambshead, a London scientist, “[i]f the numbers are correct it would take 5000 years to identify all the species.”¹¹² He goes on to state that if deep-sea mining becomes a reality, “many species could be forced into extinction before they’re even described.”¹¹³

In addition to their contribution to the Earth’s overall biodiversity, deep-sea organisms may prove useful to the biotechnology industry. Sulfur-vent microbes, for example, provide enzymes that are useful at temperatures much higher than those of their land-based relatives.¹¹⁴ Also, given their ability to process toxic chemicals, these new enzymes may be developed into agents that can break down hazardous wastes.¹¹⁵ Thus, it is quite possible that we will lose more value in genetic diversity and biotechnology applications of deep-sea organisms than we may gain from deep-sea mineral extraction.

V. ENVIRONMENTAL PROTECTION IN THE AGREEMENT AND UNCLOS III

Given the great biological wealth potentially threatened by deep seabed mining, one must determine what provisions in the seabed mining regime exist to protect this wealth. When negotiators gathered to hammer out the Law of the Sea Convention, they were preoccupied by political and economic controversies surrounding deep-sea mining, not environmental protection.¹¹⁶ Indeed, discoveries of deep-sea life and the concomitant concern for its preservation was, in many cases, relatively recent.¹¹⁷ As a result, specific environmental protection measures are sparse in the original treaty. Part XI and the Agreement do, how-

¹¹⁰ See Pain, *supra* note 13, at 7.

¹¹¹ See *id.*

¹¹² *Id.*

¹¹³ Russell, *supra* note 4, at 28.

¹¹⁴ See *id.*

¹¹⁵ See *id.*

¹¹⁶ See Brown, *supra* note 6, at 81-83.

¹¹⁷ See, e.g., Pain, *supra* note 13, at 5 (noting that “the study that really put deep-sea diversity on the ecological map was a series of 233 cores, each 30 centimeters square, taken along a 176-kilometre track off the coast of New Jersey and Delaware in the mid-1980s”); Suter, *supra* note 24, at 8 (stating that “discoveries in the last decade or so have shown that there is a new world in some parts of the seabed, teeming with life and presenting fresh challenges for scientists”).

ever, contain provisions requiring the preparation of environmental assessments prior to the commencement of mining operations.¹¹⁸ These provisions allow the Council to reject applications, but only “in cases where *substantial* evidence indicates the risk of *serious* harm to the marine environment” (emphasis added).¹¹⁹ Part XI also provides for action by the Authority in the event of environmental emergencies.¹²⁰

The most significant aspect of Part XI and the Agreement, from the perspective of environmental protection, are the mechanisms they created through which specific protective measures may be drafted. Article 145 of Part XI, for example, provides that “[n]ecessary measures shall be taken in accordance with this Convention with respect to activities in the Area to ensure effective protection for the marine environment from harmful effects which may arise from such activities.”¹²¹ Specifically, Article 145 instructs the Authority to develop rules, regulations and procedures for the prevention of environmental harms and for the protection and conservation of natural resources on the seabed.¹²² The Agreement reiterates this command for the adoption of rules, regulations and procedures by the Authority.¹²³ Therefore, Part XI and the Agreement provide the foundation on which to create specific environmental protections in the seabed mining regime.

A. Regulations on Prospecting and Exploration for Polymetallic Nodules in the Area

On July 13, 2000, the Authority enacted its first piece of legislation, the Regulations on Prospecting and Exploration for Polymetallic Nodules in the Area (Regulations), providing a first glimpse at the details of environmental protection in the seabed mining regime.¹²⁴ The Regulations apply only to the prelimi-

¹¹⁸ See UNCLOS, *supra* note 1, art. 165(2)(d); *Agreement*, *supra* note 7, Annex, § 1(7). Interestingly, Part XI requires that the Council prepare the environmental assessments, while the *Agreement* requires that an assessment accompany an application. *Id.*

¹¹⁹ UNCLOS, *supra* note 1, art. 165(2)(l).

¹²⁰ See *id.* art. 165(2)(k).

¹²¹ *Id.* art. 145.

¹²² See *id.*

¹²³ See *Agreement*, *supra* note 7, Annex, § 1(5)(g).

¹²⁴ See *Regulations on Prospecting and Exploration for Polymetallic Nodules in the Area*, ISBA/6/A/18, 13 July 2000 [hereinafter *Regulations*]; see also William J. Stibravy, *Regulations on Prospecting and Exploration for Deep-Sea Polymetallic Nodules Adopted by UN Body* (last visited Aug. 22, 2000) <<http://www.uscib.org/news/>

nary stages of the mining process: prospecting and exploration.¹²⁵ Further, the Regulations apply only to exploration of polymetallic nodules, not sea vent chimneys.¹²⁶ Specifically, the Regulations govern the content of prospecting and exploration applications,¹²⁷ fees,¹²⁸ processing of applications,¹²⁹ the contents of exploration contracts,¹³⁰ protection of the marine environment,¹³¹ confidentiality,¹³² settlement of disputes¹³³ and other general provisions.¹³⁴

Environmental protection in the Regulations takes essentially three forms. First, Regulation 18 requires applicants to submit and collect certain environmental data with their proposed work plans.¹³⁵ This data must include a description of the applicant's program for carrying out environmental baseline studies and monitoring the effects of exploration on the marine environment.¹³⁶ A contractor must also submit a preliminary assessment of the possible impact of the exploration on the marine environment.¹³⁷ Finally, the contractor must submit a description of plans for the "prevention, reduction and control of pollution

igo0822.htm>. It is important to remember that the *Regulations* are limited to prospecting or exploration of polymetallic nodules. They do not apply to full commercial mining of nodules, nor to exploration or exploitation of deep-sea vent chimneys. See PRESS RELEASE, *supra* note 11, at 2.

¹²⁵ See *Regulations*, *supra* note 124, preamble. As defined in the *Regulations*, "exploration" includes the exclusive right to search for nodules, analyze deposits, carry out studies, and test "collecting systems and equipment, processing facilities and transportation systems." See *id.* Regulation 1(3)(b). "Prospecting" is a more cursory examination of mining possibilities, without exclusive rights. See *id.* at Regulation 1(3)(e).

¹²⁶ See PRESS RELEASE, *supra* note 11, at 2.

¹²⁷ See *Regulations*, *supra* note 124, Regulations 10-18.

¹²⁸ See *id.* Regulation 19.

¹²⁹ See *id.* Regulations 20-22.

¹³⁰ See *id.* Regulations 23-30.

¹³¹ See *id.* Regulations 31-34.

¹³² See *id.* Regulations 35-36.

¹³³ See *id.* Regulation 39.

¹³⁴ See *id.* Regulations 37-38.

¹³⁵ See *id.* Regulation 18.

¹³⁶ See *id.* Regulation 18(b); see also *id.* Regulation 31(4) (stating that "[e]ach contract shall require the contractor to gather environmental baseline data and to establish environmental baselines . . . against which to assess the likely effects of its program of activities under the plan of work for exploration on the marine environment and a program to monitor and report on such effects."). The contractor, after developing the monitoring program, must report annually to the Secretary-General on its implementation and results. See *id.* Regulation 31(5).

¹³⁷ See *id.* Regulation 18(c). Section 5.5 of the Standard Clauses for Exploration Contract requires the contractor to submit to the Authority "a site specific environmental impact statement based on available meteorological, oceanographic and environmental data collected during the preceding phases of exploration and containing data that could be used to establish an environmental baseline," in addition to an assessment of the likely effects of exploration on the marine environment. See *Regulations*, *supra* note 124, Annex 4.

and other hazards, as well as possible impacts, to the marine environment."¹³⁸ These pollution prevention measures must protect the environment "as far as reasonably possible using the best technology available to it."¹³⁹

If any data is missing from the exploration application, the application may be sent back to the applicant for revision.¹⁴⁰ If such data is absent in the amended application, the Commission may withhold approval of the application.¹⁴¹ Further, the Commission may only recommend approval of the application if the plan of work provides for "effective protection and preservation of the marine environment."¹⁴² Therefore, collection and evaluation of environmental data is one of the environmental protections embedded in the Regulations.

The second prong of the Regulations' environmental protections is provisions governing environmental emergencies, and is perhaps the strongest protection measures in the regime.¹⁴³ When the Secretary-General becomes aware of any incident that has or will likely cause serious harm to the marine environment, she or he shall take such measures "as are practical and reasonable in the circumstances to prevent, contain and minimize serious harm to the environment."¹⁴⁴ After receiving a report of the incident from the Secretary-General and hearing recommendations from the Commission, the Council may issue emergency orders.¹⁴⁵ These orders may require the contractor to suspend or alter operations.¹⁴⁶ If the contractor does not act to prevent serious harm, the Council will take measures to prevent, contain and minimize the harm.¹⁴⁷

The third prong of the Regulations' environmental protections is in the form of financial guarantees to pay for any environmental emergencies. For example, the contractor must provide the Council with a "guarantee of its financial and technical capability to comply promptly with emergency orders or to assure that the Council can take such emergency measures."¹⁴⁸ If the contractor does

¹³⁸ *Id.* Regulation 18(d).

¹³⁹ *Id.* Regulation 31(3).

¹⁴⁰ *See id.* Regulation 21(8).

¹⁴¹ *See id.*

¹⁴² *Id.* Regulation 21(4)(b), 21(5).

¹⁴³ *See id.* Regulation 32.

¹⁴⁴ *Id.* Regulation 32(2).

¹⁴⁵ *See id.* Regulation 32(1). In addition to the Council and the Commission, the Secretary-General will also make the report available to all members of the Authority, international organizations, and other concerned organizations. *See id.*

¹⁴⁶ *See id.* Regulation 32(5).

¹⁴⁷ *See id.* Regulation 32(6).

¹⁴⁸ *Id.* Regulation 32(7).

not provide the Council with this guarantee, the contractor's sponsoring state will be responsible for ensuring that assistance is provided to the Council in the event that it has to respond to emergency orders.¹⁴⁹

Therefore, the Regulations provide the first concrete protections for the environment in the seabed mining regime. So far, the environmental protection embedded in the Regulations consists primarily of data collection and evaluation, emergency response provisions, and provisions placing financial responsibility of such emergency response on either the contractor or the sponsoring state. These measures are an impressive first step by the Authority toward meaningful environmental protection. However, because the Regulations are the product of a delicate compromise,¹⁵⁰ they leave room for improvement.

VI. STRENGTHENING ENVIRONMENTAL PROTECTION IN THE REGULATIONS

Since the Authority has adopted the Regulations, after significant compromise, it can now strengthen environmental protections in the seabed mining regime within the Regulations' established framework. The Regulations contemplate such strengthening, stating that the Regulations "may be supplemented by further rules, regulations and procedures, in particular on the protection and preservation of the marine environment."¹⁵¹ The recommendations discussed below may be divided in three main categories: 1) creating more detailed requirements for environmental assessments by establishing a database of environmental baselines; 2) strengthening provisions requiring financial and technical guarantees for emergency orders; and 3) interpreting certain terms so as to provide the environment the greatest possible protection.

A. Detailed Environmental Assessments

In order for the environmental assessments to effect meaningful protection, they must be sufficiently detailed. Several specific measures should be included in the environmental assessments.¹⁵² First, in line with its mandate to

¹⁴⁹ *See id.*

¹⁵⁰ *See* PRESS RELEASE, *supra* note 11, at 1.

¹⁵¹ *Regulations*, *supra* note 124, Regulation 1(5).

¹⁵² Many of the following proposals are inspired by provisions of the California Environmental Quality Act (CEQA). *See* CAL. PUB. RES. CODE §§ 21000-1177 (Deering 1996). An excellent reference on CEQA is

“apply a precautionary approach,” the Authority must make environmental protection and conservation an explicit, overriding goal.¹⁵³ For example, there must be a clear statement of policy that work plans, which involve substantial environmental harm, will not be approved.¹⁵⁴ Such a policy statement would send a signal to both applicants and to the members of the Commission that environmental protection is a priority.

Second, the environmental assessment must include a detailed description of the baseline environment.¹⁵⁵ A properly described baseline should be the result of serious scientific study¹⁵⁶ and should include findings from explorations and feasibility studies as well as current knowledge regarding the particular site or ones similar to it. An Authority workshop recently recommended that environmental assessments should include discussion of exploration techniques and potential mining systems, the biological environment, the chemical environment, the physical environment, and geochemical impacts.¹⁵⁷ In addition,

MICHAEL H. REMY ET AL., GUIDE TO THE CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA) (9th ed. 1996) [hereinafter GUIDE].

¹⁵³ Regulations, *supra* note 124, Regulation 31(2).

¹⁵⁴ Such a statement of policy could be added to the governing rules of the Commission under Regulation 1(5). An example of such a statement is that “Environmental assessments which reveal that mining operations will result in significant loss of unique marine life, significant pollution, or any other significant environmental harm, as determined by the Council, will result in the denial of the mining application.”

¹⁵⁵ See, e.g., GUIDE, *supra* note 152, at 98-105 (describing “baselines” for purposes of CEQA analysis). CEQA defines “environment” as “the physical conditions which exist within the area. See CAL. PUB. RES. CODE § 21060.5 (Deering 1996). The CEQA Guidelines (a non-binding, but very authoritative implementation guide found in the California Code of Regulations, § 15000 [hereinafter Guidelines]) state that environmental impact reports must include “a description of the environment in the vicinity of the project, as it exists before the commencement of the project . . .” See Guidelines § 15125. Requiring a description of the pristine, untouched environment is important because environmentalists are most concerned with discoveries of unique species and fragile ecosystems.

¹⁵⁶ Because the Agreement puts the responsibility of the assessments on the applicants, the responsibility of the study would also fall on the applicant. See Agreement, *supra* note 7, Annex, § 1(7).

¹⁵⁷ See generally OFFICE OF RESOURCES AND ENVIRONMENTAL MONITORING, INTERNATIONAL SEABED AUTHORITY, DEEP-SEABED POLYMETALLIC NODULE EXPLORATION: DEVELOPMENT OF ENVIRONMENTAL GUIDELINES 1 (1999) [hereinafter DEVELOPMENT]. Requiring a catalogue of resources in the physical and biological environment sections would serve multiple goals. First, it would increase scientific knowledge of the seabed. Second, it would force both the applicant and the Council to consider a fuller range of ramifications of mining activities, and lead to a more economically and environmentally rational result. Third, it creates the possibility of a genetic biodiversity bank of organisms and knowledge of the area. While the biodiversity bank might address the fears of environmentalists and scientists, it raises questions of ownership that are beyond the scope of this Article.

endangered species existing at or near the site should receive special consideration.¹⁵⁸

Including a detailed baseline description makes clear the opportunity costs involved in a mining operation, and should lead to more rational decision making. For example, if the proposed mining site contains only a few unique species, the value of minerals at a site may outweigh the value of biodiversity found there. If the site contains a wealth of unique species diversity, on the other hand, it may well be a more rational choice to leave the site unmined and the genetic resources available for exploitation instead.

Third, the environmental assessment should include a serious discussion of alternatives and mitigation measures.¹⁵⁹ Alternatives should, of course, include a no-action option, as well as alternative locations and extractive methodologies.¹⁶⁰ This section should include a discussion of the costs and benefits of each option. Costs should include operational costs and opportunity costs of not developing the particular site, as well as the environmental costs including the type and number of organisms sacrificed or disrupted as a result of the operations. Requiring a serious discussion of alternatives provides another safeguard to ensure rational and informed decision-making.

Environmental assessments should also require a discussion of reasonable mitigation measures that will be taken to offset the environmental costs of the operation.¹⁶¹ The Authority should make clear that it may suggest additional mitigation measures and require its implementation as a condition of plan approval. Adding this provision would force applicants to account for externalities of mining operations in their applications.

Finally, the Authority should require that environmental assessments be made available for public comment and review, excluding confidential and proprietary portions of the assessment, prior to authorizing the plan.¹⁶² To ensure

¹⁵⁸ CEQA requires that an environmental impact report, as opposed to a simpler environmental assessment or negative declaration, be performed if the project has the *potential* to affect endangered species. See Guidelines § 15065; CAL. PUB. RES. CODE § 21083 (Deering 1996); see also GUIDE, *supra* note 152, at 106-07.

¹⁵⁹ See, e.g., CAL. PUB. RES. CODE § 21061 (Deering 1996) (providing example of alternative requirements); see also GUIDE, *supra* note 152, at 279-301 (describing complexity of alternatives requirement under CEQA).

¹⁶⁰ Consideration of alternatives under CEQA must include the "no project" alternative. See Guidelines, *supra* note 155, § 15126(d)(4).

¹⁶¹ See, e.g., CAL. PUB. RES. CODE § 21002 (Deering 1996) (requiring agencies to adopt feasible mitigation measures); see also GUIDE, *supra* note 152, at 239-79 (discussing mitigation requirement).

¹⁶² See Regulations, *supra* note 124, Regulation 35 (discussing proprietary data and information and confidentiality).

maximum dissemination of the information and obtain the widest array of comment, the proposed environmental assessment should be made available on the internet.¹⁶³ Public review would provide a check on the Authority's decision making. It would also give further recognition to the principle that the resources of the Area are the "common heritage of mankind."¹⁶⁴ In addition to making the environmental assessments available to the public, the Authority should create a database of environmental baselines.¹⁶⁵ Doing so would increase scientific knowledge and potentially decrease exploration costs in the Area.

B. Stronger Guarantee Provisions

Another needed supplement to the Regulations is a stronger guarantee of technical and financial resources in the event of an environmental emergency. First, requirements of technical and financial capability to carry out proposed work plans should also be explicitly required.¹⁶⁶ Second, the Regulations state that contractors must prove that they have the financial and technological capabilities to comply with emergency orders.¹⁶⁷ If they can not make such a guarantee the Regulations provide that the sponsoring state must ensure that assistance is provided to the Authority to carry out emergency orders.¹⁶⁸ Instead, the Authority should reject applications if the contractor cannot make such a guarantee, or find some other entity to make the requisite guarantee, thus placing the burden squarely on the contractor. Finally, future rules should be adopted that require financial and technical capabilities not only to "prevent, contain or minimize serious harm to the marine environment,"¹⁶⁹ but also to perform any reasonable clean-up.

¹⁶³ See DEVELOPMENT, *supra* note 157, at 236 (recommending that "[e]nvironmentally important data . . . should be freely available for scientific analysis and an inventory of the data holdings from each contractor should be accessible on the World Wide Web").

¹⁶⁴ UNCLOS, *supra* note 1, art. 136 (declaring that seabed resources are "the common heritage of mankind").

¹⁶⁵ See *supra* notes 157-161.

¹⁶⁶ See, e.g., Regulations, *supra* note 124, Regulation 12(1) (stating that "[e]ach application for approval of a plan of work for exploration shall contain specific and sufficient information to enable the Council to determine whether the applicant is financially and technically capable of carrying out the proposed plan of work for exploration and of fulfilling its financial obligations to the Authority.")

¹⁶⁷ See *id.* Regulation 32(7).

¹⁶⁸ See *id.*

¹⁶⁹ *Id.* Regulation 32(5).

C. Interpretation

Finally, the Authority should issue guidelines in order to interpret the Regulations in the most protective manner possible. For example, the Regulations currently require that contractors “take necessary measures to prevent, reduce and control pollution and other hazards to the marine environment arising from its activities in the Area *as far as reasonably possible using the best technology available to it*” (emphasis added).¹⁷⁰ The words “to it” create a subjective “best available technology” standard. However, this provision should be interpreted as requiring the use of the best available technology on the market, not simply the best technology that the contractor can afford.

Further, the Regulations state that the contractor will be responsible for any damage “arising out of *wrongful acts*” during its operations (emphasis added).¹⁷¹ “Wrongful” should not be interpreted as requiring an element of intent. Mere negligence should suffice for liability to attach.

Finally, the Regulations provide extensive protection for confidential and proprietary information.¹⁷² “Confidential” should be interpreted as excluding scientific facts, such as the information collected for the determination of environmental baselines. An interpretation that would consider such information confidential or proprietary would seriously impede the progress of scientific knowledge of the Area.

Adopting the above recommendations would tighten the Regulations environmental protection, reduce the possibility of escaping liability, and contribute to a greater scientific understanding of the Area. The recommendations should also allay the fears of environmentalists of massive, unchecked environmental destruction. The collection of information regarding species diversity also addresses the concerns of scientists and the biotechnology industry who fear biodiversity loss. Further, these recommendations are consistent with Part XI’s mandate for protection of the marine environment¹⁷³ and the Regulations’ commitment to a “precautionary approach.”¹⁷⁴ Finally, the recommendations do not alter the delicate balance struck during the drafting of the Regulations.¹⁷⁵

¹⁷⁰ *Id.* Regulation 31(3).

¹⁷¹ *Id.* Regulation 30.

¹⁷² *See id.* Regulations 35-36.

¹⁷³ *See* UNCLOS, *supra* note 1, art. 145.

¹⁷⁴ *Regulations, supra* note 124, Regulation 31(2).

¹⁷⁵ *See* PRESS RELEASE, *supra* note 11, at 1.

VII. CONCLUSION

The recommendations detailed here have the primary virtue of mandating informed decision-making. They may also be a way to strike the balance between entrepreneurs and environmentalists. While not completely precluding the possibility of mining operations, these measures should ensure that such operations would give due attention to their environmental consequences. Not everyone will be happy under such a regime. But at least people will, in theory, know what they are doing.

