



Duke Environmental Law & Policy Clinic

Ryke Longest, Director • Michelle Nowlin, Supervising Attorney
210 Science Drive, Box 90360 • Durham, NC 27708-0360
Telephone: (919) 613-7169 • Toll Free: (888) 600-7274 • Fax: (919) 613-7262

June 9, 2017

Via electronic mail to consultation@isa.org.jm

International Seabed Authority
14-20 Port Royal Street
Kingston, Jamaica

RE: Discussion Paper on the Development and Drafting of Regulations on Exploitation for Mineral Resources in the Area (Environmental Matters)

Dear Members of the International Seabed Authority:

In response to the invitation in your January 2017 Discussion Paper titled “Developing a Regulatory Framework for Mineral Exploitation in the Area,” the Duke University Environmental Law and Policy Clinic (“the Clinic”) respectfully submits the following comments regarding the Regulations on Exploitation for Mineral Resources in the Area (“Draft Regulations”).

The Clinic commends the Authority for the Draft Regulations, and acknowledges that uncertainty about the Area makes the regulatory process challenging. The Clinic agrees with the ISA in respect of the need for a precautionary approach, ecosystem-based management, knowledge-gathering mechanisms, and clear legal standards. These principles form a strong foundation for the deep-seabed mining regime.

However, the Clinic is concerned that the Draft Regulations fail to ensure “effective protection for the marine environment” as is explicitly required by Article 145 of the United Nations Convention on the Law of the Sea (“UNCLOS”).¹ We also are concerned that the Draft Regulations fail to give adequate weight to the challenges posed by the magnitude of scientific uncertainty in the deep-sea environment. In particular, the scientific community widely agrees that there is currently insufficient knowledge of the deep sea to predict the full extent of the effects of deep-seabed mining on vulnerable ecosystems. As a result, the Clinic wishes to emphasize the importance of information-gathering mechanisms that enable the international community to assemble baseline data on the deep sea in advance of potentially-destructive mining.

Given the ISA’s fundamental protective responsibilities, and the uncertainty surrounding the effects of deep-sea mining, the Clinic calls for the immediate postponement of Exploitation Activities until scientific evidence shows that mining can proceed without damaging the marine environment. By these comments, the Clinic respectfully offers specific suggestions for improving protection of the marine environment, and for addressing uncertainty.

¹ See United Nations Convention on the Law of the Sea [hereinafter UNCLOS], art. 145, Dec. 10, 1982, 1833 U.N.T.S. 397 (“Necessary 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.”).

Duke Environmental Law and Policy Clinic

The Clinic gratefully acknowledges the important steps the ISA has taken in publishing the Draft Regulations and hopes to assist in this process. We wish the ISA success in developing regulations that manage deep-sea resources in a way that preserves the Area for future generations. Please feel free to contact us if you have questions or concerns about our comments and summary recommendations.

Sincerely,

Duke Environmental Law and Policy Clinic

Michelle Nowlin, J.D., M.A., Clinical Professor of Law
Dana Baker, Ph.D. Candidate, Nicholas School of the Environment
Brianna Elliott, M.E.M.
Hayden Hashimoto, J.D.
Jeffrey McLaughlin, J.D.
Michael Munoz, J.D.
Ryan Pitts, J.D.
Arlene Tweedie, LL.B., LL.M.
Nathan Walker, M.E.M.

TABLE OF CONTENTS

SUMMARY OF COMMENTS.....	5
I. THE ISA SHOULD POSTPONE MINERAL EXPLOITATION IN THE AREA UNTIL SCIENTIFIC EVIDENCE DEMONSTRATES THAT SUCH EXPLOITATION WILL NOT CAUSE SERIOUS HARM TO THE MARINE ENVIRONMENT.	8
II. THE ISA SHOULD REVISE THE DRAFT REGULATIONS TO MORE CLEARLY INCORPORATE THE PRECAUTIONARY PRINCIPLE.....	9
A. Draft Regulation 7 Must be Amended to Clarify When and How the Precautionary Approach Will be Applied.....	9
B. Draft Regulation 7 Must be Revised to Make Clear that the Precautionary Principle Applies in the Face of Scientific Uncertainty.....	11
C. The ISA Should Delete the Reference to “Serious Harm.”	13
III. THE ISA SHOULD CLOSE REGULATORY GAPS AND REVISE TERMS THAT COULD SIGNIFICANTLY UNDERMINE KEY PROVISIONS AND IMPLEMENTATION GOALS. ..	15
A. The ISA Should Define Substantial Evidence and Serious Harm in Draft Regulation 16 by Referencing the Precautionary Principle and by Lowering the Threshold for Excluding Areas Susceptible to Damage.....	16
B. The ISA Should Develop a Multi-Phase Adaptive Management Plan that Establishes the Timeline under which Mining Activities will be Reviewed.	22
IV. THE ISA SHOULD GATHER MORE INFORMATION ABOUT THE DEEP-SEABED ENVIRONMENT AND THE ENVIRONMENTAL IMPACTS OF DEEP-SEABED MINING BEFORE ALLOWING EXPLOITATION ACTIVITIES TO PROCEED.....	25
A. Direct Impacts	26
B. Impacts from Plumes	26
C. Impacts on Migratory Species.....	28
D. Impacts of Ocean Noise	29
E. Social, Cultural, and Community Impact Assessment of Deep-seabed Mining Activities.....	32
F. Cumulative Impacts	34
V. THE DRAFT REGULATIONS SHOULD BE REVISED TO INCLUDE MEASURES THAT PROMOTE CAUTION, TRANSPARENCY, STRATEGIC MANAGEMENT, AND INFORMATION DISSEMINATION.....	35
A. Environmental Baseline Assessments.....	36
B. Strategic Environmental Management Plans	37
C. Protected Areas	38
D. Impact Reference Zones and Preservation Reference Zones	39
E. Environmental Review Procedure	39

F. Best Practices for Environmental Assessments and Environmental Impact Statements	40
G. Ecosystem-Based Management	41
H. Mitigation Measures	42
I. Observer Coverage.....	45
J. Knowledge Sharing, Transparency, and Public Access	47
CONCLUSION	48
APPENDIX.....	49

SUMMARY OF COMMENTS

Due to the enormous biodiversity of deep seabed ecosystems and the significant paucity of information about these ecosystems, we urge against any exploitation of deep sea mineral resources until the ISA gathers more baseline information and develops robust monitoring and management frameworks.

However, if the ISA decides to move ahead with deep seabed mining, it has the responsibility to do so in a way that safeguards the common heritage of humankind, as mandated in Articles 136 and 145 of UNCLOS.² Thus, the Clinic's goal is to suggest a framework to safeguard biodiversity and ecosystem function, and prevent long-term, catastrophic damage to the seabed.

In order to conform to the requirements of UNCLOS and customary principles of international law, the ISA should revise the Draft Regulations in several respects. Specifically, the ISA must clarify and expand on the application of the precautionary approach, articulate clear definitions for "serious harm" and "substantial evidence," devise a rigorous and structured regime for the collection of scientific information prior to resource exploitation, encourage scientific research on the deep-sea environment, further develop management and policy regimes, and improve transparency and data sharing. The Clinic provides detailed comments on each of these points in the balance of this letter. In summary, we respectfully provide the following suggestions:

- **The ISA should postpone deep-sea mineral exploitation until scientific evidence shows that exploitation can proceed in a manner that preserves the resources and ecology of the deep-sea environment for future generations.** UNCLOS Article 145 expressly requires the ISA to protect the deep-sea environment that belongs to all humankind. Before mining occurs, the ISA should therefore implement responsible environmental management practices, such as baseline ecological studies, environmental impact statements, reports on the biological and social impacts of exploitation, and monitoring systems for both mined and unmined areas. The ISA must not proceed with deep-sea mining until such measures have established scientific information sufficient for an informed decision as to whether the environmental, social, and economic costs of mining outweigh its speculative economic benefits. Deep-sea exploitation threatens the destruction of an unknown environment—one that might hold secrets that future generations could use for the immense benefit of humankind.³ We therefore urge the ISA to wait for scientific consensus on how to minimize environmental impacts before authorizing the exploitation of this fragile and irreplaceable environment.
- **The ISA should revise the Draft Regulations to clarify the scope of application of the precautionary approach, and to explain *how* the ISA, Contractors, and States, must apply the precautionary approach to applications for Exploitation Activities.** The Draft Regulations refer to the precautionary approach as "one of [its] guiding values,"⁴ and Draft Regulation 7 supports broad application of the precautionary approach in the deep-seabed environment. However, the phrase "serious harm" does not seem to support the precautionary approach in this context, and the Clinic therefore urges the ISA to replace the phrase "serious harm" with "significant adverse

² UNCLOS, art. 136 ("The Area and its resources are the common heritage of [hu]mankind."); UNCLOS, art. 145 (measures must be taken to "ensure effective protection of the marine environment" from activities in the Area).

³ Jesús M. Arrieta, Sophie Arnaud-Haond & Carlos M. Duarte, *What Lies Underneath: Conserving the Oceans' Genetic Resources*, 107 PNAS 18318, 18319 (2010).

⁴ International Seabed Authority, A Discussion Paper on the development and drafting of Regulations on Exploitation for Mineral Resources in the Area (Environmental Matters), at 13, ¶ 7.19 (Jan. 2017) [*hereinafter* Draft Regulations].

change” from the definitions section. As noted in the Draft Regulations, the fundamental issue with respect to the precautionary principle concerns its operation. Draft Regulation 7 does not detail how the ISA plans to apply the precautionary approach when reviewing applications. The ISA must either revise and expand upon Draft Regulation 7 or create a new regulation to clarify that the precautionary principle applies in all situations where there is uncertainty regarding the impacts of seabed mining, and to provide additional details about how the precautionary approach will be applied.

- **The ISA should revise the regulatory language to require stronger, more structured mechanisms to develop scientific information about deep-sea ecosystems.** While the Draft Regulations prohibit applications where substantial evidence indicates a risk of serious harm to the marine environment, this standard requires further clarification. The ISA must clarify the meaning of the terms “serious harm” and “serious harmful effects” in Draft Regulations 16, 45, 54, 74, and in the definitions set out in Schedule 1. These terms must be defined in a manner that ensures the application of the precautionary approach and that reflects the paucity of fundamental scientific knowledge about the deep-seabed environment.
- **The ISA should substantially revise and clarify the regulatory language governing the application and environmental review process of work proposals.**⁵ As written, the process of drafting, submitting, and reviewing a Plan of Work is dispersed among numerous sections and subsections of the Draft Regulations, particularly Parts III–IV for preparing environmental plans, and Parts V–X for public consultation and Legal and Technical Commission (“Commission”) review. These provisions leave many questions unanswered, such as the applicant’s responsibilities throughout the application process, the exact timing and content of mandatory submissions, and the organization of each analysis and conclusion into a synthesized determination of environmental impact. Moreover, the entire review process is rendered problematic by the ISA’s reliance on information provided by the applicant, which has an inherent conflict of interest with the aims of the ISA and UNCLOS more broadly. These flaws risk the ISA’s approval of vague and inconsistent applications, despite insufficient knowledge of the ecological characteristics and impacts in the deep sea environment. The ISA also fails to outline specific conservation goals in an effective environmental review process. Hence, the current environmental review procedure runs the risk of proving ineffectual, which raises the possibility of a violation of the duty to protect the marine environment under Article 145.⁶ The Clinic thus recommends that the ISA provide a coherent timeline of when (and which) applicants prepare and submit environmental assessments, including how they might conduct pre-approval noninvasive studies of work sites; how those assessments are to be structured into a single (or phased) application; when that application is expected to be reviewed and commented upon by interested persons and the Commission; the Commission’s and ISA’s environmental protection objectives; and what separate standards of review will determine final approval.

●

⁵ Draft Regulations, p.17 (“[D]oes the working draft follow a logical flow to the development of environmental assessment and management in the Area? . . . “[D]o any Draft Regulations appear superfluous or adding little value? . . . [I]s the structure and content of the working draft adequate / fit-for-purpose?”).

⁶ See UNCLOS, art. 145 (“[T]he Authority shall adopt appropriate rules, regulations and procedures for . . . the prevention, reduction and control of pollution and other hazards to the marine environment, . . . particular attention being paid to the need for protection from harmful effects of such activities as drilling, dredging, excavation, disposal of waste, construction and operation or maintenance of installations, pipelines and other devices related to such activities; . . . and the prevention of damage to the flora and fauna of the marine environment.”).

- **The ISA should revise the regulatory language to establish a standardized methodology for the baseline ecological studies, environmental impact assessments, studies of cumulative biological and social impacts, mitigation measures, and long-term monitoring of mined and excluded areas in the deep-sea environment.** The Clinic recommends that the ISA amend Draft Regulations 17, 18, 19, 20, 21, 22, and 23 to ensure robust scientific data collection and scientific monitoring. Adaptive management should be incorporated and used throughout the mining process. These mechanisms would enable the ISA to better understand, mitigate, and prevent catastrophic damage, and ensure that mining proceeds in a precautionary manner, minimizing harm to an environment that is the common heritage of humankind.
- **The ISA should incorporate adaptive management principles into the exploitation regulations by developing a phased implementation framework.** The Draft Regulations explicitly call for exploration of how an adaptive management approach can be implemented in the deep-sea mining context in light of the precautionary approach and sound environmental management.⁷ To accomplish this goal, the ISA should develop an implementation plan, review sites where activities may be permitted, and revise the regulations to reflect ISA experience and input from applicants, interested persons, and the scientific community. By planning to implement the Draft Regulations in such phases, the ISA could adapt the regulatory regime to incorporate new information about deep sea ecosystems, best practices in site assessments and activities, and stakeholder suggestions in the application and review process.
- **The ISA must complete the environmental planning process *before* additional exploration leases are granted to avoid conflicts and ensure that the extent of mining operations fits into regional environmental plans.** In the Clarion-Clipperton Zone (“CCZ”), attempts to develop a robust network of exclusion areas were complicated by already-established exploration leases.⁸ To avoid this circumstance in other parts of the world’s oceans, the ISA must develop environmental management plans and establish exclusionary areas *prior* to granting leases. Furthermore, pre-existing exploration leases must not preclude the ISA from excluding ecologically significant areas from mining. The mandate of UNCLOS Article 145, and the commitment on the part of the ISA to the precautionary approach, means that the ISA must protect the common heritage of humankind in all the areas beyond national jurisdiction, without regard to whether portions of those areas are subject to existing leases.
- **The ISA must account for potential environmental impacts, such as mining plumes, ocean noise, and threats to migratory species.** Adverse environmental impacts from plumes, such as smothering and toxicity,⁹ pose a grave risk to the marine environment. Impacts associated with

⁷ Draft Regulations, Part IX Sec. 1 (“[T]he application of an adaptive management approach was discussed at the Gold Coast workshop in May 2016 but no definitive conclusions as to its suitability and / or content reached. AM requires a dedicated working group to explore the issues connected with its implementation. It would appear, as one generally accepted implementation of the precautionary approach and sound, good environmental management, that AM should be applied in a deep[-]sea mining context.”).

⁸ Kristina M. Gjerde & Anna Rulska-Domino, *Marine Protected Areas beyond National Jurisdiction: Some Practical Perspectives for Moving Ahead*, 27 INT’L J. MARINE & COASTAL L. 351, 367 (2012); Rosemary Rayfuse, *Precaution and the Protection of Marine Biodiversity in Areas Beyond National Jurisdiction*, 27 INT’L J. MARINE & COASTAL L. 773, 780 (2012).

⁹ MIDAS, IMPLICATIONS OF MIDAS RESULTS FOR POLICY MAKERS: RECOMMENDATIONS FOR FUTURE REGULATIONS 10 (2016), available at https://www.eu-midas.net/sites/default/files/downloads/MIDAS_recommendations_for_policy_lowres.pdf.

ocean noise, toxicology, and habitat fragmentation also pose a significant risk of serious harm to the marine environment. The ISA must carefully consider the possible extent of such environmental impacts to inform mitigation measures and best available technology standards.

- **The ISA should revise the regulatory language to establish clear guidelines for knowledge-sharing between companies, sponsoring states, and the public.** Transparency and the free sharing of data are key to an effective regulatory regime. Accordingly, the ISA should ensure that all non-proprietary data are freely accessible. All information submitted to the ISA should be presumed open for public review unless the party submitting that information expressly designates particular information to be protected from disclosure and demonstrates to the satisfaction of the ISA that the submitting party could otherwise be placed at a disadvantage. The regulatory language should establish procedures that allow any interested party or person to locate relevant data easily and quickly on all aspects of particular mining plans or proposals. These procedures should include establishing a publicly-accessible online data repository for all information submitted to, or gathered by, the ISA.

I. THE ISA SHOULD POSTPONE MINERAL EXPLOITATION IN THE AREA UNTIL SCIENTIFIC EVIDENCE DEMONSTRATES THAT SUCH EXPLOITATION WILL NOT CAUSE SERIOUS HARM TO THE MARINE ENVIRONMENT.

The ISA operates pursuant to specific, mandatory environmental protection duties explicitly set out in UNCLOS. While several of the ISA's duties are economic in nature, UNCLOS is clear that the ISA bears commensurate duties for environmental protection and resource management. For example, Article 150(b) requires the "orderly, safe, and rational management of resources of the Area, including the efficient conduct of activities in the Area and, in accordance with sound principles of conservation, the avoidance of unnecessary waste."¹⁰ This duty operates in tandem with the "common heritage of [hu]mankind" in Article 153, which directs the ISA to execute its duties on behalf of all "[hu]mankind as a whole."¹¹ Articles 136 and 140 reinforce this obligation, making clear that the ISA manages a deep sea environment and resources that belong to all humankind.¹² UNCLOS imposes on the ISA's management a duty of environmental preservation and requires the ISA to meet "the needs of the present without compromising the ability of future generations to meet their own needs."¹³

Consistent with these aims, the deep sea environment should not be destroyed for temporary economic gain. Yet deep sea exploitation poses exactly this risk. It threatens an environment that could take millions of years to recover,¹⁴ posing a direct conflict with the principle of the common heritage. The ISA must therefore delay deep seabed mining until scientific evidence shows that mining can proceed in a manner that preserves the marine environment for future generations, and an effective review process for exploitation applications can be implemented and enforced.

Based on the current state of scientific knowledge, the absence of baseline data, the high degree of uncertainty surrounding impacts, the risk of catastrophic damage, and the lengthy recovery time for deep sea ecosystems after disturbance, the common heritage and the precautionary approach to deep seabed

¹⁰ UNCLOS, art. 150(b).

¹¹ *Id.*, art. 153(1).

¹² *Id.*, arts. 136 and 140.

¹³ THE WORLD COMMISSION ON ENVIRONMENT AND DEVELOPMENT, OUR COMMON FUTURE, Part I, ¶ 27 (1987), [*hereinafter* BRUNDTLAND REPORT].

¹⁴ Lisa Levin *et al.*, *Defining "Serious Harm" to the Marine Environment in the Context of Deep-Seabed Mining*, 74 MARINE POL'Y 245, 250 (2016).

mining require that Exploitation Activities be postponed until applicants provide scientific evidence sufficient to demonstrate that mining will not cause serious harm or significant adverse change to the marine environment. Indeed, the seabed represents precisely the sort of context in which the European Commission indicated that a total ban “may be the sole possible response to a potential risk.”¹⁵ The ISA’s authority to do so is clear in UNCLOS, which mandates both the ISA Council and the Legal and Technical Commission to exclude areas from exploitation when they find that “substantial evidence indicates a risk of serious harm to the marine environment.”¹⁶ A ban is the only way to ensure effective protection of the marine environment in the face of uncertainty and potentially catastrophic damage at this time.¹⁷

II. THE ISA SHOULD REVISE THE DRAFT REGULATIONS TO MORE CLEARLY INCORPORATE THE PRECAUTIONARY PRINCIPLE

The precautionary approach must be applied to any proposal for extraction activities in the deep sea because seabed mining poses a high risk of catastrophic harm to the marine environment. As the ISA has stated, “the primary obligation in the Convention is to ensure the ‘effective protection for the marine environment from harmful effects’ from seabed mining (art. 145).”¹⁸ To this effect, the International Tribunal for the Law of the Sea has recognized that the precautionary principle helps ensure protection of the marine environment,¹⁹ and therefore forms “an integral part of the ‘due diligence’ obligation.”²⁰ Moreover, the precautionary principle has attained customary international law status.²¹ Thus, the ISA was correct to incorporate the precautionary approach in the Draft Regulations.

However, more clarity is required to determine when and how the precautionary approach will be applied in the Draft Regulations, and to ensure its application in the face of scientific uncertainty. In addition, the precautionary approach demands that the ISA develop baseline information *before* mineral exploitation takes place and irreparable damage is done. We offer the following recommendations to provide this clarity.

A. Draft Regulation 7 Must be Amended to Clarify When and How the Precautionary Approach Will be Applied.

Draft Regulation 7 details the ISA’s approach to the precautionary principle in the context of Exploitation Activities and states the following:

Draft Regulation 7

Precautionary Approach

All persons engaged in activities in the Area shall apply the Precautionary Approach, as reflected in Principle 15 of the Rio Declaration, to the assessment and management of risk of harm to the Marine Environment

¹⁵ *Commission Communication on the Precautionary Principle*, ¶ 6.3.1, COM (2000) 001 final (Feb. 2, 2000) [*hereinafter* Precautionary Principle Communication].

¹⁶ UNCLOS, arts. 162(2)(x), 165(2)(l). These concepts of “substantial evidence” and “serious harm” are discussed in detail below, particularly with regard to the precautionary principle. *See infra* Section II.

¹⁷ *See* Levin *et al.*, *supra* note 14.

¹⁸ International Seabed Authority, *Analysis of the Draft Regulations on Prospecting and Exploration for Polymetallic Sulphides and Cobalt-Rich Ferromanganese Crusts in the Area*, ISBA/12/C/2 (Part II), at 9 (May 24, 2006) [*hereinafter* Analysis on Polymetallic Sulphides and Cobalt-Rich Ferromanganese Crusts].

¹⁹ *Id.*, ¶¶ 122–23.

²⁰ *Id.*, ¶ 131.

²¹ *Id.*, ¶ 135.

from Exploitation Activities in the Area and where scientific evidence concerning the scope and potential negative impact of the activity in question is insufficient but where there are plausible indications of potential risks of Serious Harm to the Marine Environment.

There are two problems with the current text of Draft Regulation 7: (1) the text fails to make clear that the precautionary approach *always* applies where there is uncertainty; and (2) the text fails to provide important details regarding how the precautionary approach will be applied by contractors, states, and the ISA. The ISA must revise the language in Draft Regulation 7 to provide clarity and emphasize the broad scope of the precautionary approach's application, and add a new Draft Regulation to address these issues.

For the reasons detailed in the balance of this section of the comments, the Clinic recommends that the ISA revise Draft Regulation 7 and add a new regulation explaining how the precautionary approach will be applied in the deep-sea context, as follows:

All persons engaged in activities in the Area shall apply the Precautionary Approach consistent with Principle 15 of the Rio Declaration, to the assessment and management of risk of harm to the Marine Environment from Exploitation Activities in the Area, ~~and~~ **The Precautionary Approach shall be applied** where scientific evidence concerning the scope and potential negative impact of the activity in question is insufficient ~~but~~ **to prove that the Exploitation Activities will not harm the Marine Environment and** where there are plausible indications of potential risks of ~~Serious Harm~~ **Significant Adverse Changes** to the Marine Environment.

A license shall not be issued for Exploitation Activities where the Best Available Scientific Evidence provides plausible indications of potential risks of Significant Adverse Change to the Marine Environment. When deciding whether to issue a license for Exploitation Activities, the ISA shall use a uniform process for determining whether the burden of proof with regard to scientific evidence has been satisfied for all applicants, and thus the requirements will not vary based on the applicant's capabilities.

While Draft Regulation 7 suggests support for broad application of the precautionary principle to deep-seabed mining, it does not clearly articulate the full extent of the principle's applicability. For example, Draft Regulation 7 states that "[a]ll persons engaged in activities in the Area shall apply the Precautionary Approach,"²² but the rest of its language qualifies, limits, or narrows the circumstances for its application. Draft Regulation 7 explains that the principle will be applied to "the assessment and management of risk of harm to the Marine Environment from Exploitation Activities in the Area,"²³ but the Draft Regulations do not define "Exploitation Activities." It is therefore unclear how this Regulation will affect the application of the principle to those activities that do not qualify as "Exploitation Activities." To ensure that its application is not narrowed, the ISA should change "Exploitation Activities" to "Activities" to remain consistent with the opening phrase of the Draft Regulation.

²² Draft Regulations, Reg. 7.

²³ *Id.*

B. Draft Regulation 7 Must be Revised to Make Clear that the Precautionary Principle Applies in the Face of Scientific Uncertainty.

The ISA must clarify the threshold of uncertainty at which the precautionary principle applies in the deep seabed mining context. This question has two aspects: (1) the probability of harm, and (2) the gravity of harm. Regarding the probability of harm, the Clinic commends the ISA for adopting ITLOS's "plausible indication of possible risk"²⁴ trigger for application of the precautionary principle, though the ISA must ensure that this language is interpreted as setting a low threshold. Regarding the gravity of harm, the Clinic is concerned that the "serious harm" language could preclude the precautionary principle from operating in circumstances where the scientific evidence is insufficient to determine the magnitude of potential harm.

On the question of gravity of harm, it is important to note the strong consensus that a showing of irreversible damage is not required to trigger the precautionary approach. There is widespread agreement among authorities that irreversible harm would be too strict a requirement, and even Principle 15 of the Rio Declaration, which includes the word "irreversible," would allow reversible damage to trigger the precautionary approach if it is "serious." The following examples may aid the ISA in refining its approach.

Regulation 31(2) of the ISA's Exploration Regulations states that "to ensure effective protection for the marine environment from harmful effects which may arise from activities in the Area, the Authority and sponsoring States shall apply a precautionary approach, as reflected in Principle 15 of the Rio Declaration."²⁵ This language is similar to Article 145 of UNCLOS, which states 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."²⁶ The language used in these authorities mandates the use of the precautionary principle to provide "effective protection" for the marine environment from "harmful effects" which may arise.

Like Regulation 31(2) of the Exploration Regulations, Draft Regulation 7 references Principle 15 of the Rio Declaration. Principle 15 states that "[i]n order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."²⁷ Although the Clinic agrees that the precautionary approach should be "widely applied," we are concerned about two other aspects of Principle 15. First, the "capabilities" language raises concerns, as many States lack the capability to apply the precautionary approach because of the remoteness and expense of studying deep-sea ecosystems. Second, the language regarding "threats of serious or irreversible damage" sets too high a threshold in the context of deep seabed mining, which is characterized by significant potential for damage and a high degree of uncertainty.

It is therefore essential for the ISA to clarify that some aspects of Principle 15 are inapplicable to deep-seabed mining. The application of the precautionary approach by states "according to their capabilities"²⁸ relates to the concept of common but differentiated responsibilities and is irrelevant to deep-sea mining. Principle 15 addresses situations in which affirmative action is necessary *to protect* a resource

²⁴ Draft Regulations, Reg. 7.

²⁵ International Seabed Authority, *Regulations on Prospecting and Exploration for Polymetallic Nodules in the Area*, Reg. 31(2) (July 13, 2000) [*hereinafter* Exploration Regulations].

²⁶ UNCLOS, art. 145.

²⁷ Rio Declaration on Environment and Development, Principle 15, *adopted* June 14, 1992, U.N. Doc. CONF.151/5/Rev.1 (1992) [*hereinafter* Rio Declaration].

²⁸ *Id.*

or the environment. In the context of climate change, for example, differentiated obligations make sense because different countries bear different degrees of responsibility for causing the problem and have different capabilities to take the required affirmative action to address it. In contrast, in the deep-sea mining context, affirmative action is the primary threat to the resources and the environment. In the absence of affirmative action to exploit the resource, there will be no direct negative impacts on the ecology or resources of the deep-sea environment. There are no differentiated responsibilities for states to bear for a harmful activity that has yet to take place. Therefore, the precautionary principle does not differentiate the responsibilities of various states based on their capabilities in cases such as seabed mining, where affirmative action is unnecessary and a threat.

Principle 15's reference to "threats of serious or irreversible damage"²⁹ could be interpreted as a higher, less environmentally-protective threshold than language used by other authorities. For example, in an advisory opinion for Case 17, ITLOS noted that the precautionary approach is "an integral part of the general obligation of due diligence of sponsoring States," and that this obligation "applies in situations where scientific evidence concerning the scope and potential negative impact of the activity in question is insufficient but where there are plausible indications of potential risks."³⁰ Although this language resembles that found in Draft Regulation 7, there is a vital difference: ITLOS's language omits any mention of serious harm, thereby indicating a lower threshold for application of the precautionary approach. In another context, the ISA has taken a similar approach, opining that the "harmful effects" language used in UNCLOS "establishes a lower threshold for action, and thus confers greater protection on the marine environment than principle 15 . . . which requires . . . a threat of 'serious or irreversible damage' before lack of full scientific certainty may be used as a reason for postponing measures."³¹ Because the ISA's authority derives from UNCLOS, it should adopt ITLOS's language and omit the reference to "serious harm" in Draft Regulation 7.

The European Commission, in terms echoing the Rio Declaration, has explained the precautionary approach is triggered "when there are *reasonable grounds* for concern that potential hazards may affect the environment or human, animal or plant health, and when at the same time the *available data preclude a detailed risk evaluation*."³² It also noted that the precautionary approach applies when there is "a potential risk, even if this risk cannot be fully demonstrated or quantified or its effects determined because of the insufficiency or inclusive nature of the scientific data."³³ The scientific community currently lacks sufficient knowledge to effectively mitigate the environmental impacts of deep-seabed mining.³⁴ Thus, the precautionary principle is at its strongest in the deep sea context.

In light of the language in UNCLOS Article 145, the ITLOS advisory opinion, the European Commission commentary, and the Exploration Regulations, Draft Regulation 7 must be interpreted to trigger the precautionary approach at a particularly low probability and gravity of risk.

²⁹ *Id.*

³⁰ International Seabed Authority, *Decision of the Assembly of the International Seabed Authority Relating to the Advisory Opinion of the Seabed Disputes Chamber of the International Tribunal for the Law of the Sea on Matters Relating to the Responsibilities and Obligations of States Sponsoring Persons and Entities with Respect to Activities in the Area* ¶ 131, ISBA/17/A/9 (July 25, 2011) [*hereinafter* ITLOS Decision].

³¹ Analysis on Polymetallic Sulphides and Cobalt-Rich Ferromanganese Crusts, p.9.

³² Precautionary Principle Communication, Annex III ¶ 3 (emphasis added).

³³ *Id.*, ¶ 5.1.

³⁴ Levin *et al.*, *supra* note 14, at 249 (discussing the lack of baseline data as grounds for imposing higher restrictions on exploitation, at least until more scientific evidence is available).

C. The ISA Should Delete the Reference to “Serious Harm.”

The Clinic is concerned that the “serious harm” language included in the Draft Regulations could be exploited by parties seeking to avoid application of the precautionary approach in situations with the potential to cause significant adverse change in the marine environment. We therefore suggest changing the “serious harm” language in Draft Regulation 7 to “significant adverse change” for the sake of clarity and to emphasize the broad applicability of the precautionary approach. This change is consistent with the ISA’s Exploration Regulations, which define serious harm to the marine environment as “any effect from activities in the Area on the marine environment which represents a significant adverse change in the marine environment determined according to the rules, regulations and procedures adopted by the Authority on the basis of internationally recognized standards and practices.”³⁵ It is also consistent with the ISA’s interpretation of “serious harm” to mean “significant adverse change.”³⁶

The Draft Regulations state that significant adverse change in the marine environment will be “determined according to the rules, regulations and procedures adopted by the Authority, on the basis of Internationally Recognized Standards and practices”³⁷ and “[t]here is no one single component that will define serious harm (or significant adverse change); that is, a number of factors/criteria will need to be considered.”³⁸ The Draft Regulations also describe significant adverse change as “important harmful changes in ecosystem diversity and integrity, the productivity of the biological communities within the Marine Environment; or the threat to human health through direct exposure to pollutants or through consumption of exposed aquatic organisms; or important loss of aesthetic recreational, scientific, or economic values.”³⁹ Determining which harmful changes are “important” is critical to defining the scope of the precautionary approach.⁴⁰

³⁵ See Exploration Regulations, Reg. 1(f); see also Draft Regulations, p.99 (“Serious Harm to the marine environment means any effect from activities in the Area on the Marine Environment which represents a Significant Adverse Change in the Marine Environment.”).

³⁶ Draft Regulations, p.9 (“[i]n defining serious harm, the Authority uses the concept of significant adverse change”).

³⁷ Draft Regulations, Schedule I (defining “Serious Harm to the marine environment”). The ISA must provide additional information regarding the “rules, regulations and procedures adopted by the Authority on the basis of internationally recognized standards and practices” that will be used to determine what qualifies as “significant adverse change.” We suggest the ISA look to the authorities referenced in these comments as the most important and influential sources of international standards and practices.

³⁸ Draft Regulations, Schedule I (defining “Serious Harm to the marine environment”).

³⁹ *Id.* (defining “Significant Adverse Change”).

⁴⁰ Draft Regulations, p.10. See also Levin *et al.*, *supra* note 14, at 249 (discussing factors indicative of significant adverse change (and therefore, likelihood of Serious Harm)). Levin *et al.* discuss factors that would indicate a significant adverse change:

“If information is not available to set particular ecological thresholds, a suite of other indicators can be used to determine the likelihood of significant adverse change and impacts, including those that address species-, community- or ecosystem-level impacts. Here all three ecological levels are considered. Significant species-level changes or impacts include: (i) extinction; (ii) significant decline in abundance; (iii) decline in foundation species; (iv) reduction below critical reproductive density; (v) loss of source populations; and/or (vi) loss of critical stepping-stone populations. Community-level impacts include (i) alteration of key trophic linkages among species in a community; (ii) reduction in species diversity beyond natural levels of variability; and / or (iii) regional declines in habitat heterogeneity, such as loss of entire habitats or community types. At the ecosystem-level, impairment of important ecosystem functions such as biomass production, nutrient recycling or carbon burial can lead to loss of major ecosystem services upon which society depends.”

The use of the word “insufficient” in Draft Regulation 7 is also problematic because it lacks the necessary context to be meaningful. The text of the regulation calls for application of the precautionary approach “to the assessment and management of risk of harm to the Marine Environment from Exploitation Activities in the Area and where scientific evidence concerning the scope and potential negative impact of the activity in question is insufficient but where there are plausible indications of potential risks of Serious Harm to the Marine Environment.”⁴¹ The problem with this language is that it is unclear what the term “insufficient” is meant to reference with respect to scientific evidence on scope and potential negative impact of the activity. If the intent is to require that scientific evidence be insufficient for assessment and management of risk of harm, the ISA should clarify that this is the case, and then should explain how it will evaluate whether scientific evidence is sufficient to assess and manage risk of harm. If this is not the intended meaning of “insufficient,” the ISA should consider supplementing the language in Draft Regulation 7 with “insufficient to prove that the Exploitation Activities will not harm the Marine Environment.”

Another critical issue for the ISA is the need to define the required measures and steps that must be taken by contractors, sponsoring states, and the ISA once the precautionary approach is triggered. The ISA has recognized that the “fundamental question”⁴² to address is how to apply the approach, and the Clinic agrees that “[f]urther thought and guidance is needed to ensure that the approach is embedded in a risk assessment and management framework.”⁴³ It is important to note that Draft Regulation 7 applies only to “persons engaged in activities in the Area,”⁴⁴ and therefore does not indicate what measures the ISA itself will take when applying the precautionary approach to the review of applications for deep-seabed mining. It is essential that the ISA provide additional information regarding these measures, as the precautionary approach is the “primary tool by which this protection from harmful effects is to be achieved.”⁴⁵ The ISA must provide this information to achieve its own goals of transparency and accountability.⁴⁶

The Clinic suggests the ISA either expand on Draft Regulation 7 or add a new regulation that details how contractors, states, and the ISA will apply the precautionary approach throughout the application and approval process for Exploitation and Exploration Activities. We suggest a process whereby decision-making entities start from the assumption that when faced with a high degree of uncertainty and the potential for catastrophic damage, the approval process will not continue to the next stage unless industry and sponsoring States can prove that Exploitation Activities will not cause significant adverse change to the marine environment. This is consistent with the mandate under UNCLOS Article 196, which requires the following:

States shall take all measures necessary to prevent, reduce and control pollution of the marine environment resulting from the use of technologies under their jurisdiction or control, or the intentional or accidental introduction of species, alien or new, to a particular part of the marine environment, which may cause significant and harmful changes thereto.⁴⁷

The burden should be on industry and sponsoring States to prove that Exploitation Activities can

⁴¹ Draft Regulations, Reg. 7.

⁴² Draft Regulations, Sec. 1, Comment 7.18.

⁴³ *Id.*, Comment 7.19.

⁴⁴ *Id.*, Reg. 7.

⁴⁵ Analysis on Polymetallic Sulphides and Cobalt-Rich Ferromanganese Crusts, ¶ 28.

⁴⁶ Draft Regulations, Reg. 10.

⁴⁷ UNCLOS, art. 196.

proceed safely, not on the ISA or outside groups to prove harm. This is consistent with Draft Regulation 21, which requires that “[t]he burden of proof [be] on an Applicant to demonstrate that the risk of the Environmental Impacts, and consequential Mitigation and management thereof, will meet the Environmental Objectives of the Authority and that the Plan of Work is environmentally Acceptable.” At the same time, the ISA, as the ultimate decision maker, cannot abdicate its responsibilities under UNCLOS and should engage in rigorous evaluations of applications and scientific evidence to fulfill its mandates. The ISA should set clear requirements that mining companies must demonstrate they have met before mining may proceed, and independent scientific bodies should evaluate whether contractors have met these requirements. The ISA should also require the applicant to prove that the proposed project complies with all other ISA mandates and responsibilities. The Clinic recommends that application of the precautionary approach in this context require “a vigorous pursuit of a research agenda to overcome the uncertainties that exist [in the deep sea context].”⁴⁸

Finally, the Clinic supports the ISA’s recommendation that a working group be established to further explore how “significant adverse change” should be interpreted and applied in the context of deep seabed mining. The Clinic also generally agrees with the use of science to inform the definition of “significant adverse change.” However, in this context, the word “significant” should not be interpreted as statistically significant in the scientific sense; doing so would be problematic for several reasons. First, a requirement of statistical significance would sharply contradict the language already used in Draft Regulation 7, because “plausible indications of potential risks” are unlikely to be sufficient to achieve statistical significance. A requirement of statistical significance thus would seriously restrict the scope of the precautionary approach’s applicability to Exploitation Activities – a result that would be inconsistent with the ISA’s duty to protect the marine environment. Furthermore, from a practical perspective, in a context like deep seabed mining where research is lacking and there is a high degree of uncertainty, defining “significant” as “statistically significant” would set the bar for application of the precautionary approach far too high. In accordance with the ISA’s responsibility to protect the marine environment, the precautionary approach should be applied broadly and not limited to situations that have statistical significance.

III. THE ISA SHOULD CLOSE REGULATORY GAPS AND REVISE TERMS THAT COULD SIGNIFICANTLY UNDERMINE KEY PROVISIONS AND IMPLEMENTATION GOALS.

There are many ways in which the legal principles and interpretative issues described above can be implemented to improve the clarity and effectiveness of the Draft Regulations’ text and structure. For example, Draft Regulation 16 contains a key intersection of the definitions of “substantial evidence” and “serious harm,” yet fails to address important details about the evidentiary burdens those terms impose and the types of evidence that will meet the substantial evidence standard. We recommend revisions to these terms consistent with the precautionary approach, thereby strengthening the ISA’s authority to exclude areas from being mined. We believe that lowering the standard for exclusion by modeling the evidentiary determinations on UNCLOS’ use of the term “serious harm” will better enable the ISA to fulfill its duties under UNCLOS’ Articles 162 and 165. We propose revisions to Draft Regulation 16 in subsection A below, presenting three disjunctive options for exclusion that offer the ISA more leeway in carrying out its duty to protect the common heritage of humankind.

Additionally, in response to the ISA’s explicit call to “explore the issues connected with”⁴⁹ adaptive management, the Clinic recommends that the ISA develop a multi-phase adaptive management plan for

⁴⁸ Jon M. Van Dyke, *Applying the Precautionary Principle to Ocean Shipments of Radioactive Materials*, 27 OCEAN DEV. & INT’L L. 379, 380 (1996).

⁴⁹ Draft Regulations, Part IX, Sec. 1.

implementing the Draft Regulations. The ISA must address certain critical issues, including how many applications will be chosen for review, and on what timeline. The precautionary and common heritage principles require that the ISA make these determinations to ensure it does not issue widespread mining authorizations without an ecosystem-wide plan for protecting the marine environment under Article 145. An adaptive management plan will limit and prioritize the number of applications for initial review, and establish points in the overall implementation of the Draft Regulations through which the ISA can improve the text to better reflect institutional goals and stakeholder feedback.

A. The ISA Should Define Substantial Evidence and Serious Harm in Draft Regulation 16 by Referencing the Precautionary Principle and by Lowering the Threshold for Excluding Areas Susceptible to Damage.

Consistent with our comments in Section II, above, the ISA should apply the precautionary approach to place the burden of proving non-harm on Contractors or persons seeking to engage in activities in the Area. This approach would maximize adherence to the ISA's environmental protection mandate and ensure that no mining takes place until its effects can be understood.⁵⁰ Because so little baseline data exist, it is at present impossible to assess and comprehend the full scale of impacts – environmental or cultural – of mining the deep sea floor. In this section, the Clinic offers revisions to Draft Regulation 16, which in its current form places an evidentiary burden upon the ISA to exclude areas for mining.⁵¹ These recommendations clarify the ISA's authority to protect the marine environment by excluding areas susceptible to damage, and shift the burden of proof to the applicant.

The Clinic recommends that Regulation 16 be revised to read as follows:

No activities shall be permitted in an area:
(a) disapproved for Exploitation by the Council, in cases where Substantial Evidence indicates the risk of Serious Harm Significant Adverse Change to the Marine Environment; and-or
(b) otherwise designated by the Council as an area in respect of which no Exploitation Activities shall occur according to the relevant Strategic Environmental Management Plan developed by the Authority and approved by the Council; or
(c) otherwise disapproved for Exploitation by the Council.

In addition, the Clinic recommends revising the definition of the term “substantial evidence” as follows:

“Substantial Evidence” means Best Available Scientific Evidence consisting of relevant, adequate and well-informed studies and research conducted and assessed by Appropriately Qualified Experts qualified to evaluate Environmental Impacts and Effects in the Area and where ~~it-such experts~~ **experts** can reasonably be concluded by such experts, on the basis of such evidence and reasonable scientific confidence, there is a risk of ~~Serious Harm Significant Adverse Change~~ **Reasonable scientific confidence in the deep-seabed environment may**

⁵⁰ See *id.* at 359 (noting that the precautionary principle “requires those who want to undertake new development to engage in scientific studies to determine the effect of their initiatives and [] to consider less intrusive approaches”).

⁵¹ Draft Regulations, Reg. 16.

⁵² *Id.*

entail a relatively high degree of uncertainty. In keeping with the precautionary principle, such uncertainty shall not be grounds for a finding that the Authority has not met the substantial evidence standard in a given exclusion decision.

Our rationale for these revisions is discussed below. This discussion provides further context for our recommendation to replace the use of the term “serious harm” with “significant adverse change” in Section II, above (and applied consistently to our proposed revisions throughout this comment letter), and is relevant whether or not the ISA decides to retain the term “serious harm” in the Final Regulations.

1. Serious Harm

The Draft Regulations define Serious Harm to the marine environment as:

any effect from activities in the Area on the Marine Environment which represents a Significant Adverse Change in the Marine Environment determined according to the rules, regulations and procedures adopted by the Authority, on the basis of Internationally Recognized Standards and practices.

This definition is inconsistent with the UNCLOS use of the term “serious harm.” Moreover, it fails to identify the types of activities or effects that constitute serious harm for the purpose of excluding areas for exploitation. To better understand the meaning of serious harm, the ISA must look to the history of UNCLOS’s development and its own Nodule Regulations.

a. UNCLOS

UNCLOS employs the term “serious harm” mainly in Articles 162 and 165, which set forth the ISA’s responsibilities. In this context, the term’s history is informative. Articles 162 and 165 underwent one major change during the Convention’s decade-long drafting, which took place from 1973 to 1982. The text that became Article 162 initially referred to “irreparable harm to a unique environment” rather than “serious harm to the marine environment.”⁵³ This evolution in UNCLOS’s use of the term helps explain what serious harm is *not*: damage need not be irreversible to be considered serious. Allowing otherwise would destroy any sort of protective goal of UNCLOS, as well as conflict with the precautionary approach and the notion of the common heritage of humankind. Similarly, the expansion of coverage from only “unique environments” to “the marine environment” gives serious harm some context and reflects a concern for the sea as the common heritage of humankind.

Expanding the language to specify the marine environment also harmonizes Articles 162 and 165 with the rest of UNCLOS, which addresses the marine environment generally. Like the change from “irreparable harm” to “serious harm,” replacing “unique” with “marine” represents a more broadly protective vision of the ISA’s duties. However, as with serious harm, “marine environment” is never clearly defined in UNCLOS. In other treaties and conventions, the United Nations uses the term “Marine Environment” to mean something larger than specified individual locations, but smaller than the entire

⁵³ Third United Nations Conference on the Law of the Seas, *45th meeting of the First Committee*, ¶¶ 49-50, U.N. Doc. A/CONF.62/C.1/SR.45 (Apr. 25, 1979) (detailing recommendations from U.S. delegation). This change, along with several other protective proposals, was submitted by the United States delegation to the Convention in committee and was recommended for incorporation into UNCLOS on April 26, 1979. *Id.*, U.N. Doc. A/CONF.62/L/36 (Apr. 26, 1979). It should be noted that, while involved in the drafting process, the United States has never joined UNCLOS.

ocean.⁵⁴ We therefore recommend that the ISA define “marine environment” to make its meaning consistent across U.N. Conventions. That is, effects on the “marine environment” are effects within an area of the ocean, including higher up in the water column. The *travaux préparatoires* of UNCLOS support this interpretation. A 1983 Note by the UN Environment Programme Secretariat⁵⁵ notes that UNCLOS echoes Principle 21 of the Stockholm Declaration.⁵⁶ As such, the enforcement provisions of UNCLOS bind the ISA to adopt an “integrated approach” to addressing pollution from *all* sources, from mining on the seafloor to surface vessel activity.⁵⁷ This integrated approach clearly traces activities’ effects through the entire water column. For this integrated approach to be effective, the marine environment must be construed as the entire area where mining effects may be felt. Although the outer limits of the marine environment are not entirely clear, it includes at a minimum the area of any planned activity, plus the area affected by such activity, including the water column above mining sites.

b. Nodule Regulations

The ISA has also expounded upon “serious harm” in its Nodule Regulations, describing the term as “any effect from activities in the Area on the marine environment which represents a significant adverse change in the marine environment.”⁵⁸ This definition is nearly identical to that in the Draft Regulations. However, the Draft Regulations’ introductory comments express a degree of skepticism as to whether “significant adverse change” is something that can be scientifically measured.⁵⁹ The Clinic lauds the ISA’s efforts to root the “significant adverse change” standard in science and agrees with its suggestion that the question be submitted to an expert working group so as to provide a useful operationalization of “serious harm.”⁶⁰ On that subject, the Clinic calls upon the ISA to consult scientific literature proposing certain measures of significant adverse change.⁶¹

2. “Substantial Evidence”

The Draft Regulations contain several references to “substantial evidence” of “a risk of serious harm” to the marine environment.”⁶² On exclusions, Draft Regulation 16 states that:

⁵⁴ See, e.g., Convention on the Protection of the Marine Environment of the Baltic Sea Area, Helsinki, art. 4(1), Mar. 22, 1974, 13 I.L.M. 546 (1974) (using “Marine Environment” to identify the Baltic Sea as comprising “the water-body and the sea-bed including living resources and other forms of life”).

⁵⁵ Third United Nations Conference on the Law of the Seas, *Note by the Secretariat*, U.N. Doc. A/CONF.62/WS/36 (Feb. 18, 1983).

⁵⁶ *Id.* This Principle, according to the UNEP Secretariat, stands for the binding proposition that “States have the obligation to protect and preserve the marine environment.”

⁵⁷ See *id.*

⁵⁸ International Seabed Authority Assembly, *Decision of the Assembly relating to the regulations on prospecting and exploration for polymetallic nodules in the Area*, 6th Sess., 76th mtg., Reg. 1(3)(f), U.N. Doc. ISBA/6/A/18 (July 13, 2000).

⁵⁹ See Draft Regulations, Comments 7.3-7.7 (noting that a definition for serious harm “eludes” ISA stakeholders and asking whether an effect can exist without a change).

⁶⁰ *Id.*, Schedule 1, n.75. At a minimum, serious harm could include: (1) evidence of significant sedimentation and plume movement outside of the direct mining area, (2) fauna extinction in immediate and intermediate area, (3) significant changes to salinity or water quality, and (4) shifts in community structure. However, even these terms warrant clearer definitions of terminology and baseline information to understand how they may shift. This cannot be established until benchmark data is collected.

⁶¹ See, e.g., Levin *et al.*, *supra* note 14, at 249 (listing several indicators that can be used to determine significant adverse change). While the FAO Guidelines cited here are illustrative, they do not represent an exhaustive list of factors that constitute significant adverse change or serious harm.

⁶² Draft Regulations, Reg. 45(1)(b).

No activities shall be permitted in an area:
(a) disapproved for Exploitation by the Council, in cases where Substantial Evidence indicates the risk of Serious Harm to the Marine Environment;
and (b) otherwise designated by the Council as an area in respect of which no Exploitation Activities shall occur according to the relevant Strategic Environmental Management Plan developed by the Authority and approved by the Council.⁶³

This Section considers how substantial evidence and serious harm fit within the framework of the precautionary principle and offers guidance on how the ISA should allocate the burden of proving serious harm or lack thereof in its exclusion decisions. It is worth noting that the language of Draft Regulation 16 tracks the language of UNCLOS Articles 162(2)(x) and 165(2)(l), which also address disapproval of areas for exploitation.⁶⁴ This connection to UNCLOS informs the definition of substantial evidence in the Draft Regulations.

It is therefore crucial to define the term “substantial evidence,” as the Draft Regulations cannot have a protective effect unless they articulate what conditions prohibit exploitation. The Draft Regulations propose the following definition:

“Substantial Evidence” means Best Available Scientific Evidence consisting of relevant, adequate and well-informed studies and research conducted and assessed by Appropriately Qualified Experts qualified to evaluate Environmental Impacts and Effects in the Area and where it can reasonably be concluded by such experts, on the basis of such evidence and reasonable scientific confidence, there is a risk of Serious Harm to the Marine Environment.⁶⁵

While this definition is helpful in that it is rooted in science, it fails to establish a clear legal threshold to guide the ISA’s decisions regarding exclusions. For example, while the definition describes the type of evidence that can be considered substantial, it does not explain the quantum of evidence required to meet the substantial evidence standard.

In 2016, a workshop between the ISA and Griffith Law School sought to clarify and more concretely define the term “substantial evidence.”⁶⁶ According to the resulting report (“Griffith Report”), some attendees criticized the substantial evidence threshold as “very high,” especially given the dearth of evidence regarding the ecological condition of the deep seabed.⁶⁷ The term “best available scientific

⁶³ *Id.*, Reg. 16. Draft Regulation 45 also mentions serious harm: “In deciding whether to grant an exploitation application, the Commission must consider whether the applicant has demonstrated that the planned mining activities ‘will not cause foreseeable Serious Harm to Vulnerable Marine Ecosystems and that plans are in place to deal with any Unforeseen Serious Harm,’ thereby shifting the burden in the application process to the applicant.”

⁶⁴ UNCLOS, art. 162(2)(x) (stating that the Council shall “disapprove areas for exploitation . . . where substantial evidence indicates the risk of serious harm to the marine environment.” Article 165(2)(l) uses nearly identical language).

⁶⁵ Draft Regulations, Schedule 1.

⁶⁶ See generally GRIFFITH UNIVERSITY LAW SCHOOL & INTERNATIONAL SEABED AUTHORITY, GRIFFITH LAW SCHOOL AND THE INTERNATIONAL SEABED AUTHORITY WORKSHOP ON ENVIRONMENTAL ASSESSMENT AND MANAGEMENT FOR EXPLOITATION OF MINERALS IN THE AREA, CO-CHAIR’S REPORT, INTERNATIONAL SEABED AUTHORITY (2016), <https://www.isa.org.jm/files/documents/EN/Pubs/2016/GLS-ISA-Rep.pdf> [*hereinafter* GRIFFITH REPORT].

⁶⁷ *Id.*, ¶ 80.

evidence,” as defined in the Draft Regulations, suggests that the type of evidence that qualifies is necessarily context-specific—that is, the evidence available will determine what meets the threshold. While this definition implies a connection to the precautionary principle, that connection is not entirely clear. This definition should be clarified by linking the evidentiary standard of best available scientific evidence to the precautionary principle.

The myriad unknowns in the deep-seabed environment make it difficult to implement “substantial evidence” as a standard of proof for exclusion. The Griffith Report sought to address this problem by noting that because proof is difficult (if not impossible) to obtain in the deep sea, evidence in the seabed context can take the form of probabilistic evidence; that is, evidence demonstrating probability may be sufficient to meet the substantial evidence standard given the lack of truly probative evidence in the seabed environment.⁶⁸ The Griffith Report suggested looking to the “contours of key definitions underpinning environmental assessment [including] those adopted by the CBD Guidelines on Marine and Coastal Activities [] and the [United Nations Food and Agricultural Organization’s (“FAO”)] Guidelines on Vulnerable Marine Ecosystems.”⁶⁹ We similarly recommend that the ISA look outward and consider whether other conceptions of substantial evidence might be useful in the sea bed exploration and exploitation regime.

While the FAO Guidelines do not use the phrase “substantial evidence,” they provide a standard for evaluating adverse impacts that roughly equates to serious harm in the UNCLOS context. In determining whether an impact is significantly adverse, the FAO Guidelines consider the intensity and severity of the impact, the spatial extent of the impact compared to habitat availability, the sensitivity of the ecosystem to the impact, the ability of the ecosystem to recover, the extent of the alteration to the ecosystem, and the duration of the impact relative to species and habitat needs.⁷⁰ However, while the FAO Guidelines provide an evidentiary foothold for the substantial evidence standard, they do little to clarify the legal meaning of the phrase.

A definition of “best available science” or “best available scientific evidence” in scientific contexts has eluded scientists and policy makers for quite some time;⁷¹ there is no doubt that the same question will pose significant challenges to the ISA. In the United States, many key environmental statutes call for decision making that hinges on “best available science,” but defining and applying “best available” is challenging.⁷² It is a recurring question whether “best available” provides enough evidence for decision making. The ISA needs to decide on precise triggers for when sufficient scientific evidence exists. An independent review board must be convened to discuss this further.⁷³

Understanding that the Draft Regulations are covered by the precautionary principle, the ISA must interpret substantial evidence in light of the precautionary principle’s assumptions about the lack of

⁶⁸ *Id.*

⁶⁹ *Id.*, ¶ 86.

⁷⁰ U.N. Food and Agriculture Organization, *International Guidelines for the Management of Deep-Sea Fisheries in the High Seas*, ¶¶ 17–18 (2009) (describing significant adverse impacts as those that “compromise ecosystem integrity (i.e. ecosystem structure or function) in a manner that: (i) impairs the ability of affected populations to replace themselves; (ii) degrades the long-term natural productivity of habitats; or (iii) causes, on more than a temporary basis, significant loss of species richness, habitat or community types”).

⁷¹ Patrick Sullivan *et al.*, *Defining and Implementing Best Available Science for Fisheries and Environmental Science, Policy, and Management*, 31 MARINE SCIENCES FACULTY SCHOLARSHIP 460, 460 (2006)

⁷² *Id.*

⁷³ Dennis Murphy & Paul Weiland, *Guidance on the Use of Best Available Science under the U.S. Endangered Species Act*, 58 ENVIRONMENTAL MANAGEMENT 1, 1-2 (2016).

scientific information.⁷⁴ When read in isolation, Draft Regulation 16's references to substantial evidence and serious harm appear to set a higher bar than the precautionary principle by requiring objectively substantial evidence of a specific risk of harm. However, for Draft Regulation 16 to have protective effect, it must be read in conjunction with the precautionary approach. Employing this interpretive method, "substantial evidence" should be read to refer to evidence that is substantial in light of the precautionary principle. Substantial evidence then becomes the best available scientific evidence accounting for the uncertainty inherent in any situation where the precautionary approach applies. This definition comports with the probability approach endorsed by the ISA/Griffith Law School workshop.

The Clinic notes that the Draft Regulations' definition of substantial evidence is not inconsistent with this interpretation, as it calls for best available scientific evidence based on "reasonable scientific confidence."⁷⁵ In the deep seabed environment, scientific confidence is necessarily lower due to the current lack of baseline data. Still, in such environments, experts may reach conclusions with "reasonable scientific confidence," as the reasonableness standard is flexible and can vary situationally. The Clinic recommends, therefore, that the definition of "substantial evidence" more explicitly link the evidentiary standard to the precautionary principle. It should do so by requiring the best available scientific evidence reflecting uncertainty in situations where the precautionary approach applies. A proposed revision to the definition of substantial evidence follows:

"Substantial Evidence" means Best Available Scientific Evidence consisting of relevant, adequate and well-informed studies and research conducted and assessed by Appropriately Qualified Experts qualified to evaluate Environmental Impacts and Effects in the Area and where ~~such experts~~ it can reasonably be concluded by, on the basis of such evidence and reasonable scientific confidence, there is a risk of ~~Serious Harm Significant Adverse Change~~ to the Marine Environment.⁷⁶ Because the deep seabed environment is an area in which the precautionary principle applies, reasonable scientific confidence in the deep seabed environment may entail a relatively high degree of uncertainty. In keeping with the precautionary principle, such uncertainty shall not be grounds for a finding that the Authority has not met the Substantial Evidence standard in a given exclusion decision.

The Clinic also notes that, as currently written, Draft Regulation 16 is perhaps redundant, or even an unnecessary impediment to the ISA's exclusion of areas of exploitation. By connecting its clauses with the conjunctive "and" rather than a disjunctive "or," Draft Regulation 16 would require the ISA to disapprove areas based on both substantial evidence of serious harm and a separate designation of the area as protected under a Strategic Environmental Management Plan ("SEMP").⁷⁷ Requiring both of these conditions to be satisfied before an area may be excluded creates a significant hurdle that could undermine the ISA's authority to prohibit mining in an area, even when serious environmental harm is certain. Given that significant pre-mining exploration work, specifically leasing and boundary determinations, is already moving forward in the CCZ, while SEMP development overall has stagnated, there is a strong and growing risk that the ISA will authorize widespread mining activity in areas of rich biodiversity without clear authority to revise lease boundaries when necessary to prevent or mitigate serious harm. The Clinic therefore recommends that Draft Regulation 16 be revised to state:

⁷⁴ See generally *supra* Part II.A.

⁷⁵ Draft Regulations, Schedule 1.

⁷⁶ *Id.*

⁷⁷ See *id.*, Reg. 16.

No activities shall be permitted in an area:
(a) disapproved for Exploitation by the Council, in cases where Substantial Evidence indicates the risk of Serious Harm Serious Adverse Change to the Marine Environment; and-or
(b) otherwise designated by the Council as an area in respect of which no Exploitation Activities shall occur according to the relevant Strategic Environmental Management Plan developed by the Authority and approved by the Council; or
(c) otherwise disapproved for Exploitation by the Council.⁷⁸

These changes separate the environmental standard that requires the ISA to exclude an area from other instances in which the ISA should be authorized to exclude mining activities, such as within an SEMP. They also change the conjunctive “and” to a disjunctive “or,” so as to decouple the SEMP exclusion from any exclusion that may become necessary later in the environmental review process. This revised reading would allow the ISA to act consistent with its UNCLOS obligations -- particularly those of Articles 145, 162, and 165 -- and more broadly exclude vulnerable areas from mineral exploitation.

Finally, the Clinic recommends that the ISA interpret “substantial evidence” to impose an evidentiary burden similar to that espoused for the “precautionary approach” in Draft Regulation 7. Regulation 16 is the root of the ISA’s authority to exclude areas in the Exploitation Regulations. Thus, if the ISA seeks to faithfully fulfill its commitment to the Precautionary Principle and UNCLOS, Regulation 16 cannot impose an evidentiary burden to exclude mining activities that is so high that exclusion becomes practically impossible. The burden to prove a lack of risk of environmental harm should be on the applicant, not the ISA. To effectively hold applicants to this burden, Draft Regulation 16 should buttress the ISA’s authority to exclude mining activities when substantial evidence—which can be probability-based best available scientific evidence given the applicability of the precautionary approach—indicates a risk of serious harm to the marine environment.

B. The ISA Should Develop a Multi-Phase Adaptive Management Plan that Establishes the Timeline under which Mining Activities will be Reviewed.

The ISA explicitly seeks input on how to incorporate an adaptive management approach into the Draft Regulations.⁷⁹ The principle of adaptive management (“AM”) requires mechanisms within the regulatory process that “loop” back knowledge about a site’s ecology, a mining plan’s implementation, or the effectiveness of a specific provision in ways that allow the regulations to evolve in light of new developments and knowledge. Adaptive management is not just a requirement imposed on the applicant,⁸⁰ but rather a structural element that should be built into the entire application process. While the applicant possesses some responsibility for risk assessment and management,⁸¹ the duty to protect the marine environment remains with the ISA. The ISA cannot absolve itself of this duty by shifting this burden to another party, particularly one with a financial interest in the outcome.

⁷⁸ See *id.*

⁷⁹ See *id.*, Part IX, Sec. 1. The issues the ISA raises in Part XI, Section I demonstrate that the ISA understands it must play an active role in refining its regulations throughout the life of a project, even after approval. *Id.*

⁸⁰ See *id.*, Reg. 41(q) (listing factors for LTC evaluation of the adequacy of Environmental Plans and requiring applicants to specify “the use . . . of an Adaptive Management approach”).

⁸¹ *Id.*, Sec. 1, Comment 13.1 (asking commenters whether it is “sufficiently clear that the appropriate onus / burden of proof under these regulations in terms of risk assessment and management remains with the applicant as the proponent of exploitation activities”).

In their current form, the Draft Regulations fail to incorporate AM mechanisms in an effective manner. Pursuant to Parts III-IV and V-X, each application will be processed through a single, unbroken stream of submission and review. But the Draft Regulations do not provide an overall regulatory plan that articulates which applications will move forward, nor do they explain the point in time at which this will occur after the Draft Regulations are finalized. Will the ISA field applications from all areas leased for exploration immediately? Although the scientific community's general understanding of deep-sea ecosystems has improved in recent years, there are still significant unknowns about the ecological elements of each site, such as whether there are endemic and unique species that must be protected. This is especially true regarding adverse impacts in a habitat that takes millions of years to develop.⁸² Approving projects *en masse*, without pre-determining the ecological characteristics of each site and what values and functions the ISA seeks to conserve throughout the Area, prevents the use of AM and fundamentally contradicts the common heritage and precautionary principles that govern the ISA.

Developing an overall regulatory plan would provide the ISA with an important opportunity to achieve its AM goal. We recommend a four-phased implementation plan in which the ISA (1) produces initial site classifications under a framework of desired conservation goals; (2) prioritizes certain activities in specific sites according to those goals; (3) continuously monitors any authorized activities and revises regulatory provisions pertaining to application process, environmental reviews, applicant and ISA/Commission duties, and stakeholder inputs in response to monitoring results; and (4) only then authorizes further activities under analogous circumstances.

- (1) **Site Classification Phase:** The first phase focuses on improving the ISA's understanding of the vast sections of the Area that are capable of being mined. Consistent with the precautionary approach/principle, the ISA should determine which types of mining it wishes to authorize, where it wishes to authorize mining, the current ecological characteristics of potential locations, and their preservation values in relation to the ecology of the deep sea. Are there unique species present or unique ecological characteristics at a site, such as high productivity or biodiversity, that warrant conservation? These determinations must occur at the outset, prior to authorizing any activity, so that the ISA can review work proposals against a framework that governs where development may be conducted, or should be prohibited, to achieve specific environmental preservation goals.

Given the still-developing state of scientific knowledge regarding deep-sea ecosystems, the ISA cannot realistically expect that *all* information will be available for planning. It is in situations like this that AM is particularly useful—an organization must make plans to learn more, take measured steps, and add specific “time-outs” in implementation to loop new information into adapted regulations. The Clinic believes there is a strong opportunity for cooperation in this phase between applicants and the scientific community to conduct joint scoping reports, or other studies—possibly funded by sponsoring state or contractor fees, or exploitation royalties—and to provide the ISA with an adequate foundation of knowledge to build an effective framework for implementation. Indeed, our scientific understanding is part of the common heritage of humankind, and it is thus sensible to require contractors, who stand to gain financially, to help the community of nations learn more about irreplaceable sources of information and knowledge before engaging in activities with the potential to destroy them.

- (2) **Provisional Application Phase:** This phase would involve fielding initial work proposals and considering them against the implementation framework developed above. With sites classified according to their ecological characteristics, the ISA could move forward with a small number of specific projects. Strong participation, cooperation, and knowledge-sharing among the ISA,

⁸² See generally Levin *et al.*, *supra* note 14.

applicants, and the scientific community is required in this phase because of the significant lack of knowledge about the Area.

- (3) **Modification Phase:** The actual adaptive management “looping” or “triggering” would take place in the modification phase. The ISA (and other interested persons) should study in detail the provisional mining activities described in Phase (2) to understand how anticipated impacts occur, how effective the environmental review process is in predicting such impacts, and how the application procedure can be optimized to incorporate this knowledge. New best practices should be identified and prescribed for sites with different ecological elements or different types of mining activities. The ISA should clarify how changes in the Environmental Impact Area affect the requirements on the companies to collect baseline data, write environmental assessments, and complete other steps in the application process.

A critical determination in this phase is deciding whether to revise lease boundaries, or entirely prohibit mining in a new protected area. For management to be “adaptive,” Regulation 16 must explicitly confer on the ISA authority to modify, or *adapt*, the terms of the leases and work authorizations whenever serious environmental harm occurs, or is likely to occur after work has begun. Sponsoring states, the scientific community, and other interested entities must be able to challenge or appeal lease boundaries and subsequent work authorizations to correct or improve an ISA mining authorization that is discovered to allow significant harm or otherwise violate UNCLOS or the precautionary principle as more information becomes available. While fairness and reliance by the applicant should be given due consideration and respected, to faithfully execute the duties of environmental protection and precaution the ISA must be able to adapt its conservation goals—and therefore, its prior authorizations—as information is obtained.

- (4) **Expansion Phase:** In this last phase, the adapted regulations described above would be applied to other sites identified in the initial Plan of Work. The ISA should ensure it evaluates a proposed site’s environmental characteristics and anticipated impacts on a case-by-case basis, considering its unique attributes and preservation values. The ISA can provide for further AM phases by allowing application acceptance and review in limited numbers, and repeating the regulatory revision loop described in Phase (3). Fundamentally, the ISA must avoid rubber-stamping project applications *en masse*, without a full understanding of the variety of deep-sea ecosystems throughout the Area.

These four phases incorporate an adaptive management approach by establishing an implementation framework that articulates desired environmental objectives, then authorizes specific activities in a limited fashion, before looping back new information and input from those activities into regulatory adaptations. It better reflects the common heritage and precautionary principles by recognizing the multifaceted value of the Area’s deep-sea resources and gives time to increase our knowledge *before* irreversible damage occurs.⁸³ The “precautionary approach and sound, good environmental management” that the ISA desires to incorporate demand a structured, methodical implementation plan.⁸⁴

⁸³ The value of deep-seabed resources is not limited to what minerals are present and exploitable, but includes rich and unique ecosystems of high complexity and diversity; ecological support of commercial and subsistence fisheries, as well as of birds, marine mammals, and sea turtles; rare genetic resources prized by biotechnology companies; and the opportunity to increase our understanding of the origins of life.

⁸⁴ See Draft Regulations, Part IX, Sec. 1.

IV. THE ISA SHOULD GATHER MORE INFORMATION ABOUT THE DEEP-SEABED ENVIRONMENT AND THE ENVIRONMENTAL IMPACTS OF DEEP-SEABED MINING BEFORE ALLOWING EXPLOITATION ACTIVITIES TO PROCEED.

Within the ISA's internal structure, the Legal and Technical Commission plays a crucial role in the exploration and exploitation regime. To further this goal of protection, UNCLOS specifies qualifications for Commission membership: "Members of the Legal and Technical Commission shall have appropriate qualifications such as those relevant to exploration for and exploitation and processing of mineral resources, oceanology, protection of the marine environment, or economic or legal matters relating to ocean mining and related fields of expertise."⁸⁵ The requirement for expertise in oceanology and protection of the marine environment, in addition to expertise in mineral exploitation, makes clear the Parties' objective to ensure protection and conservation of marine resources in any regime for economic exploitation. This requirement also emphasizes the importance for ISA's consideration of scientific data in its decision-making.

To comply with UNCLOS, the Draft Regulations must build upon the ISA's duties to protect the marine environment,⁸⁶ relying on scientific understanding to reconcile and balance short-term needs with long-term scarcity. Thus, when the ISA promulgates regulations, expert opinions and other scientific information must be taken into account "to secure effective protection of the marine environment from harmful effects directly resulting from activities in the Area."⁸⁷ It is imperative that the ISA consider harmful effects resulting from mining activities, including (but not limited to) drilling, dredging, coring, excavation, transportation, disposal, dumping, and discharge of effluents into the marine environment.⁸⁸ Some of the major areas of environmental impact not covered in sufficient detail in the Draft Regulations are direct impacts, impacts from plumes, impacts to migratory species, impacts from ocean noise, social and cultural impacts, and cumulative impacts.

However, it is important to note that the scientific community is still in the early stages of understanding deep-sea ecosystems: less than 0.05% of the ocean floor has been mapped in detail, and much about the basic processes in this environment remains unknown.⁸⁹ Because of this paucity of information, the deep sea was long viewed as a "desert," devoid of life.⁹⁰ Yet in 2008, when the ISA published its study of biodiversity in the CCZ, researchers were surprised by the high levels of biodiversity and by how different the systems are from near-shore ecosystems.⁹¹ Leading experts in deep sea ecology have suggested that the appropriate analogy for these ecosystems is tropical rainforests rather than deserts.⁹²

At an ecosystem level, the potential loss of important ecosystem functions such as biomass production, nutrient cycling, and carbon burial will lead to a loss of ecosystem services, such as carbon sequestration potential, fisheries production, and applications of oceanic genetic resources.⁹³ Scientific knowledge remains deficient with regard to sea-floor processes and the cumulative impacts of mining events on biogeochemistry, macro-and mega-fauna, and benthic communities across the region. There is

⁸⁵ UNCLOS, art. 165(1) (emphasis added).

⁸⁶ *Id.*, art. 165(2)(e).

⁸⁷ *Id.*, Annex III & art. 17(2)(f).

⁸⁸ *Id.*

⁸⁹ John Copley, *Just How Little Do We Know about the Ocean Floor*, SCI. AM. (Oct. 9, 2014), available at <https://www.scientificamerican.com/article/just-how-little-do-we-know-about-the-ocean-floor/>.

⁹⁰ Paul V.R. Snelgrove & J. Frederick Grassle, *The Deep Sea: Desert and Rainforest*, 38 OCEANUS 25, 25 (1995).

⁹¹ INTERNATIONAL SEABED AUTHORITY, BIODIVERSITY, SPECIES RANGES, AND GENE FLOW IN THE ABYSSAL PACIFIC NODULE PROVINCE: PREDICTING AND MANAGING THE IMPACTS OF DEEP SEABED MINING. INTERNATIONAL SEABED AUTHORITY (2008) [*hereinafter* BIODIVERSITY IN THE ABYSSAL PACIFIC NODULE PROVINCE].

⁹² Snelgrove & Grassle, *supra* note 90, at 25–26.

⁹³ Levin *et al.*, *supra* note 14, at 249.

also uncertainty about how quickly biological communities in the deep-sea can be reestablished after mining has occurred – and whether they can recover at all.⁹⁴ These gaps in knowledge must be remedied before resource exploitation may begin.

A. Direct Impacts

In addition to their high metal values, manganese nodules provide a valuable substrate for corals and other deep-sea species.⁹⁵ In studies of areas targeted for manganese nodule mining, half of the species found existed only on the nodules, and other species were found at two to three times higher density in nodule habitats.⁹⁶ Mining of these nodules will result in the complete removal of such species from the area mined, and because nodules take millions of years to form, the resulting habitat loss will be effectively permanent.⁹⁷

According to the ISA's projections, manganese nodule mining will directly remove habitat covering 300 to 800 km² per year, per operator, and indirectly disrupt an area five to ten times this size.⁹⁸ Thus, for the 15 mining contractors in the CCZ, areas of 67,500 to 180,000 km² will be directly disturbed over a 15-year mining contract. Indirect disturbances in the CCZ could cover as much as 1,800,000 km²—an area almost the size of Greenland.⁹⁹ The impacts, many of which will be permanent, will affect an area of particularly high biodiversity that is also one of the least scientifically understood places on the planet.¹⁰⁰ Such impacts cannot credibly be deemed to qualify as “sustainable development.”¹⁰¹

Other types of mining will be similarly devastating, and will affect rare and unique habitats such as hydrothermal vents, seamounts, and the highly productive upwelling regions that are valuable for commercial fisheries, marine mammals, birds, and a variety of other species.¹⁰² This unique habitat has the potential to harbor rare genetic resources that may be valuable to biotechnology and pharmaceutical companies that could be destroyed.¹⁰³ The exact impacts differ depending on the type of mining, but all will result in serious adverse impacts to species abundance, diversity, connectivity, and persistence.¹⁰⁴

B. Impacts from Plumes

Deep-sea mining will generate plumes from two sources: the mining machinery's operations on the seafloor and the disposal of wastewater from surface vessels. Before issuing leases or allowing mining to proceed pursuant to current contracts, the ISA should require leaseholders to evaluate the effects of plumes on the marine environment, including an assessment of uncertainty. Plumes can stretch up to 100 kilometers

⁹⁴ Diva J. Amon *et al.*, *Insights into the abundance and diversity of abyssal megafauna in a polymetallic-nodule region in the eastern Clarion-Clipperton Zone*, 6 SCI. REP. 1, 1 (2016).

⁹⁵ *Id.* at 8.

⁹⁶ *Id.*; Ann Vanreusel, *et al.*, A., *Threatened By Mining, Polymetallic Nodules Are Required To Preserve Abyssal Epifauna*, 6 SCI REP. 1, 1 (2016); Amon *et al.*, *supra* note 95, at 1.

⁹⁷ Levin *et al.*, *supra* note 14; Hjalmar Thiel & Forschungsverbund Tiefsee-Umweltschutz, *Evaluation of the environmental consequences of polymetallic nodule mining based on the results of the TUSCH Research Association*, 48 TOP. STUD. OCEANOGRAPHY 3433, 3443 (2001).

⁹⁸ BIODIVERSITY IN THE ABYSSAL PACIFIC NODULE PROVINCE, *supra* note 91, at 11.

⁹⁹ Central Intelligence Agency, *The World Factbook: Greenland* (last accessed Apr. 23, 2017), <https://www.cia.gov/library/publications/the-world-factbook/geos/gl.html>.

¹⁰⁰ MIDAS REPORT, *supra* note 9, at 10, 23–24.

¹⁰¹ Draft Regulations, pp.5, 11.

¹⁰² Levin *et al.*, *supra* note 14, at 250–255.

¹⁰³ *Id.*; Arrieta *et al.*, *supra* note 3, at 18318; Jochen Halfar & Rodney M. Fujita, *Danger of Deep-Sea Mining*, 316 SCIENCE 987, 987 (2007).

¹⁰⁴ Levin *et al.*, *supra* note 14, 246.

from the mining site, persist in the water column for more than fourteen years, and will be disastrous for deep-sea ecosystems.¹⁰⁵

Plume impacts, currently considered only in the commentary on Draft Regulation 18 regarding delineation of the impact area¹⁰⁶ and questions related to Draft Regulation 56 regarding waste management,¹⁰⁷ should be given substantially more weight throughout the planning process. In addition to studying the effects of plumes as part of Baseline Assessment and Environmental Impact Statements, mining contractors must be required to minimize and mitigate plume impacts in all operations and to monitor plume effects during and after operations. Contractors should be required to utilize the best available plume reduction technology and to evaluate and report the effectiveness of such measures to the ISA on a regular basis. Mining contractors must coordinate research and operations to ensure that cumulative impacts from multiple plumes do not result in serious harm to marine ecosystems. Some additional considerations for plume research and mitigation are detailed in Box 1.

Box 1. Important considerations for plume research and mitigation

- a. Spatial and temporal scope of plume impacts:¹⁰⁸
 - i. Sediment plume interaction with water column and currents.
 - ii. Plume composition, dispersal distance, height in the water column, and time in the water column.
 - iii. Models of plume dispersal and effects;
- b. Impact of marine disposal of mine tailings, and plumes on the ocean floor:
 - i. Direct effects, from smothering all benthic organisms within an area; ecological significance of smothering benthic organisms in disposal sites and the physical alteration of bottom habitat.¹⁰⁹
 - ii. Greater accumulation of sediment in canyons, trenches, and other abyssal features with unique ecological characteristics.¹¹⁰
 - iii. Clogging hydrothermal vents, and thus eliminating the resources these provide to the surrounding communities.¹¹¹
- c. Effects on the water column, where particles are added at rates orders of magnitude faster than naturally occur:¹¹²
 - i. Effects of toxic metals, both directly and indirectly, through bioaccumulation of metals through the food web, including effects on fish, marine mammals and birds.¹¹³
 - ii. Impact of increased turbidity and oxygen depletion on biological communities

¹⁰⁵ MIDAS REPORT, *supra* note 9, at 10; Susanne Rolinski, Joachim Segschneider & Jürgen Sündermann, *Long-Term Propagation of Tailings from Deep-Sea Mining Under Variable Conditions By Means Of Numerical Simulations*, 48 TOPICAL STUD. OCEANOGRAPHY 3433, 3469–85 (2001).

¹⁰⁶ Draft Regulations, Reg. 18.

¹⁰⁷ *Id.*, Reg. 56.

¹⁰⁸ MIDAS REPORT, *supra* note 9, at 10–11.

¹⁰⁹ Kristi Birney, *et al.*, Potential Deep-Sea Mining Of Seafloor Massive Sulfides: A Case Study In Papua New Guinea, (2006) (unpublished M.S. thesis, Donald Bren School of Environmental Science & Management), available at <http://www.bren.ucsb.edu/research/documents/ventstheiss.pdf>; Levin *et al.*, *supra* note 14, at 250.

¹¹⁰ Birney *et al.*, *supra* note 109, at 40–41.

¹¹¹ *Id.* at 40.

¹¹² MIDAS REPORT, *supra* note 9, at 12; Thiel, *supra* note 97, at 3447.

¹¹³ Halfar & Fujita, *supra* note 103, at 987; Levin *et al.*, *supra* note 14, at 250, 252.

- and individual species.¹¹⁴
- iii. Behavioral avoidance because of contaminants, turbidity, and other factors, or other effects on behavior (communication, feeding, bioluminescence, etc.) from plumes and toxic chemicals.¹¹⁵
- iv. Changes in primary productivity through shading, and through the deposition or suspension in the water column of nutrient-poor sediments; effects of the nutritional stress caused by these.¹¹⁶
- v. Effects on filter-feeders (both benthic and pelagic) from suspended materials.¹¹⁷
- d. Impact on planktonic organisms in the vicinity of plumes:
 - i. These may represent the most vulnerable life forms affected by heavy metals and chemical processing agents.
 - ii. Plankton may serve to transport toxic elements away from the area near the mining activity to biological communities further away.
 - iii. Impact on larvae in water column and larvae settlement potential.¹¹⁸
- e. Impact of unpredictable natural events (tsunamis, earthquakes) on plume dispersal:
 - i. Upwelling potential of geographic location, which may cause the resuspension of plume tailings.
- f. Cumulative impacts:
 - i. On habitat complexity, species abundance and diversity, and the continued function of ecosystems, caused by the combination of mining, plumes, and other activities.¹¹⁹
 - ii. Potential creation of mortality sinks, where mortality events caused by plumes and mining attract scavengers, which may also be killed, creating a cycle of continued mortality.¹²⁰

C. Impacts on Migratory Species

The severity of mining impacts on megafaunal ecology depends on the nature of the mined material and the method of extraction.¹²¹ However, mining is expected to directly impact megafauna, microfauna, and macrofauna within mined areas across broad swaths of the ocean. Assessments are necessary to understand direct and indirect impacts, such as those caused by increased noise and toxic plumes, on the horizontal and vertical migration of species. This includes developing a better understanding of species that take diurnal vertical migrations within the water column, as well as pelagic species with wide geographic distributions across the Pacific Ocean, Atlantic Ocean, and Indian Ocean. It is also important to consider the migration routes of key and endangered marine mammals throughout the Pacific Ocean, Atlantic Ocean, and Indian Ocean, and how those routes may be harmed by deep-seabed mining.

Since the establishment of UNCLOS, there has been an increase in the amount of scientific research regarding the importance of migratory and transboundary connectivity for marine biodiversity.¹²² This

¹¹⁴ Thiel, *supra* note 97; Levin, *supra* note 14, at 250, 255.

¹¹⁵ Levin *et al.*, *supra* note 14, at 250, 253.

¹¹⁶ Adrian G. Glover & Craig R. Smith, *The Deep-Sea Floor Ecosystem: Current Status and Prospects of Anthropogenic Change by the Year 2025*, 30 ENVTL. CONSERVATION 219, 230 (2003).

¹¹⁷ Levin *et al.*, *supra* note 14, at 250, 253.

¹¹⁸ *Id.*

¹¹⁹ *Id.*

¹²⁰ Glover & Smith, *supra* note 116, at 225.

¹²¹ Katia Moskvitch, *Health Check for Deep-Sea Mining*, 512 NATURE 122, 122–23 (2014).

¹²² Ben Lascelles, *et al.*, *Migratory Marine Species: Their Status, Threats and Conservation Management Needs*.

research has identified a total of 829 migratory species of fish, seabirds, marine mammals and sea turtles occurring in the Area.¹²³ Tracking data show that the California Current Large Marine Ecosystem, with which the CCZ overlaps, is an important habitat for tuna (Pacific bluefin, *Thunnus orientalis*; yellowfin, *Thunnus albacares*; albacore, *Thunnus alalunga*); sharks (shortfin mako, *Isurus oxyrinchus*; white, *Carcharodon carcharias*; salmon, *Lamna ditropis*; blue, *Prionace glauca*; common thresher, *Alopias vulpinus*), cetaceans (blue whale, *Balaenoptera musculus*), and sea turtles (leatherback, *Dermochelys coriacea*; loggerhead, *Caretta caretta*). The tracking data used in the Block study shows that several species, including the leatherback sea turtle, bluefin tuna (*Thunnus thynnus*), yellowfin tuna, and salmon sharks undertake migrations of greater than 2,000 kilometers from the western, central, and south Pacific basins.¹²⁴ Other species, such as the northern elephant seal (*Mirounga angustirostris*), yellowfin tuna, and blue whale undertake seasonally recurring north-south migrations in the North Pacific and within the California Current Large Marine Ecosystem.

Overexploitation and climate variability, coupled with the future impact of deep-sea mining, will negatively affect the abundance and distribution of these and other important migratory species across the region. While some scientific uncertainty remains regarding distribution and migration routes, it is known that the CCZ serves as a habitat for many economically-valuable pelagic species, as well as species at risk of extinction (the International Union for Conservation of Nature lists leatherbacks as vulnerable¹²⁵ and blue whales as endangered¹²⁶). The Draft Regulations make no mention of the potential impacts on species that migrate through the CCZ – or the broader Pacific Ocean, Atlantic and Indian Oceans – nor of the steps that will be taken to monitor and mitigate potential impacts. We recommend that the ISA and contracting parties consult the Convention on the Conservation of Migratory Species of Wild Animals, a United Nations Environment Programme providing a legal foundation for internationally coordinated conservation measures throughout the migratory range of various species.

D. Impacts of Ocean Noise

Ocean noise is increasing worldwide, with contributions from a variety of sources, including shipping, oil and gas exploration, renewable energy development, and military activity.¹²⁷ Noise propagates about five times faster in water than in air, and will travel great distances from the original source. Low-frequency noise, which is created by shipping and oil and gas exploration, traverses particularly great distances.¹²⁸ There is a growing body of scientific evidence describing the impacts of noise from shipping, oil and gas activity, and military activity, but there is very little information about direct noise impacts from mining. Researchers have cited noise as being a potential impact from nodule mining and mining cobalt-rich crusts, and mining seafloor massive sulphides.¹²⁹

Aquatic Conservation: Marine and Freshwater Ecosystems, 24 AQUATIC CONSERVATION 111, 112–15 (2014).

¹²³ B.A. Block, *et al.*, *Tracking Apex Marine Predator Movements in A Dynamic Ocean*, 475 NATURE 86, (2011).

¹²⁴ *Id.*

¹²⁵ B.P. Wallace, *et al.*, *Dermochelys Coriacea*, THE IUCN RED LIST OF THREATENED SPECIES (2013), available at <http://dx.doi.org/10.2305/IUCN.UK.2013-2.RLTS.T6494A43526147.en>.

¹²⁶ S.B. Reilly, *et al.*, *Balaenoptera Musculus*, THE IUCN RED LIST OF THREATENED SPECIES (2008), available at <http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T2477A9447146.en>.

¹²⁷ John A. Hildebrand, *Anthropogenic and Natural Sources of Ambient Noise in The Ocean*, 395 MARINE ECOLOGY PROGRESS SERIES 5, 5–11 (2009), available at <http://www.int-res.com/articles/theme/m395p005.pdf>.

¹²⁸ H. Slabbekoorn, *et al.*, *A Noisy Spring: The Impact of Globally Rising Underwater Sound Levels on Fish*, 25.7 TRENDS IN ECOLOGY & EVOLUTION 419, 424 (2010), available at <http://www.sciencedirect.com/science/article/pii/S0169534710000832>; Jeremy Firestone & Christina Jarvis, *Response and Responsibility: Regulating Noise Pollution in the Marine Environment*, 10 J. INT'L WILDLIFE L. 109, 116 (2007); Hildebrand, *supra* note 127, at 11.

¹²⁹ Levin *et al.*, *supra* note 14, at 251, 253; Cindy Lee Van Dover, *Impacts of Anthropogenic Disturbances at Deep-Sea Hydrothermal Vent Ecosystems: A Review*, 102 MARINE ENVTL. RES. 59, 66 (2014), available at

It is well documented that many marine species rely on some form of an “acoustic habitat” for their basic biological functions (e.g. communicating and foraging),¹³⁰ and that anthropogenic noise risks interrupting this “acoustic habitat.” Marine mammals are particularly vulnerable to impacts stemming from noise, including habitat displacement,¹³¹ physiological stress,¹³² and interference with communication.¹³³ Many mass strandings and the resultant deaths of marine mammals around the world are attributed to trauma from anthropogenic noise.¹³⁴

Like many other environmental impacts associated with deep-sea mining, the effects of noise produced from mining—including operation at the seafloor, in transport pipes, and vessel noise at the surface—are poorly understood. However, it is reasonable to assume that at a minimum, noise will be created by transport vessels at the sea surface, during construction of platforms and infrastructure in the mid-water column, and from extractive activity at the seafloor.¹³⁵ Noise levels will likely be specific to the type of mined material, duration of mining, and equipment used.

There is currently no overarching global framework or governance structure for regulating ocean noise across different industries or countries.¹³⁶ Thus, the ISA has an opportunity to take the initiative and develop a system for monitoring and mitigating noise impacts from mining activity. The ISA mentions ocean noise several times throughout the Draft Regulations,¹³⁷ and we applaud the ISA for recognizing the issue. The following provides specific answers to questions or comments on ocean noise discussed in the Draft Regulations:

- **The Draft Regulations raise several questions regarding UNCLOS and its relation to ocean noise.**¹³⁸ UNCLOS Article 209(1) requires that pollution be reduced in the Area.¹³⁹ The ISA appears to question whether (1) the Authority or Member States are responsible for regulating this mining impact, and (2) whether noise can be categorized as “pollution.”¹⁴⁰ UNCLOS defines “pollution of

<http://www.sciencedirect.com/science/article/pii/S0141113614000506>; R.E. Boschen *et al.*, *Mining of Deep-Sea Seafloor Massive Sulfides: A Review of The Deposits, Their Benthic Communities, Impacts from Mining, Regulatory Frameworks and Management Strategies*, 84 OCEAN & COASTAL MGMT. 54, 61 (2013), available at <http://www.sciencedirect.com/science/article/pii/S0964569113001671>.

¹³⁰ Christopher W. Clark, *et al.*, *Acoustic Masking in Marine Ecosystems: Intuitions, Analysis, and Implication*, 395 MARINE ECOLOGY PROGRESS SERIES 201, 203 (2009), available at <http://www.int-res.com/articles/theme/m395p201.pdf>.

¹³¹ Alexandria B. Morton & Helena K. Symonds, *Displacement of Orcinus orca (L.) by high amplitude sound in British Columbia, Canada*, 59 ICES J. MARINE SCI. 71, 71 (2002).

¹³² Rosalind Rolland *et al.*, *Evidence that Ship Noise Increases Stress in Right Whales*, 279 PROC. ROYAL SOC’Y 2363, 2366 (2012).

¹³³ Clark *et al.*, *supra* note 130, at 216-217; Linda S. Weilgart, *A Brief Review of Known Effects of Noise on Marine Mammals*, 20 INT’L J. COMP. PSYCHOL. 159, 160 (2007).

¹³⁴ U.S. DEPARTMENT OF COMMERCE & U.S. SECRETARY OF NAVY, JOINT INTERIM REPORT BAHAMAS MARINE MAMMAL STRANDING EVENT OF 15–16 MARCH 2000, 1–3 (2000), available at http://www.nmfs.noaa.gov/pr/pdfs/health/stranding_bahamas2000.pdf; A. Fernández, *et al.*, *Gas And Fat Embolic Syndrome” Involving A Mass Stranding Of Beaked Whales (Family Ziphiidae) Exposed To Anthropogenic Sonar Signals*, 42(4) VETERINARY PATHOLOGY 446, 446 and 451 (2005); Firestone & Jarvis, *supra* note 128, at 110.

¹³⁵ Levin *et al.*, *supra* note 14, at 253, 256.

¹³⁶ Firestone & Jarvis, *supra* note 128, at 122-140; Douglas P. Nowacek, *et al.*, *Marine Seismic Surveys And Ocean Noise: Time For Coordinated And Prudent Planning*, 13(7) FRONTIERS ECOLOGY & ENV’T 378, 383 (2015).

¹³⁷ Draft Regulations, Reg. 45(1)(b).

¹³⁸ *Id.* at 76

¹³⁹ UNCLOS, Art. 209(1)(2)

¹⁴⁰ Draft Regulations, p.76

the marine environment” as the following:

[I]ntroduction by man, directly or indirectly of substances or energy into the marine environment, including estuaries, which results or is likely to result in such deleterious effects as harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities.¹⁴¹

This definition of pollution clearly includes sound, as it is a form of energy introduced by humans into the marine environment and which is likely to result in harm to marine life.¹⁴² Furthermore, Article 194(1) of UNCLOS mandates that States “prevent, reduce and control pollution.”¹⁴³ In light of this language, the burden falls on both Member States and the ISA to manage noise resulting from mining operations.

- **Under Draft Regulation 56, the ISA asks: “What other specific obligations, if any, are required here – over and above adherence to and compliance with an Environmental Management and Monitoring Plan? E.g. Air quality, noise, vibration management and control?”**¹⁴⁴ Given that multiple stages of the mining process generate noise, all baseline assessments, Environmental Assessments, and other environmental reviews should consider and analyze all aspects of the mining process—from vessel port exit to port return—that introduce noise into the water column. Specifically, analyses should (1) reference all migratory and megafaunal species that exist within a lease area and use sound in their basic biological functioning, and (2) project how noise and vibration for short and long durations may affect species, communities, and structures. We also recommend that these effects be assessed initially in laboratory settings to better understand how noise may act as an independent variable in affecting deep-sea species. This type of research will provide insight into the extent of noise impacts from different types of mining, especially on unique ecosystems.

Because our knowledge is incomplete regarding the extent of potential noise inputs into the marine environment and how it will affect deep-sea ecosystems, the precautionary principle should be applied to minimize the level of noise and its impacts. The following recommendations offer guidance for minimizing and mitigating ocean noise, as well as for applying the precautionary principle in the context of ocean noise:

(1) Gather information to construct a baseline for ambient noise levels in potential areas for exploitation before commencing extraction activities.¹⁴⁵ This information-gathering step is critical to understand what type of mitigation measures to employ and what noise threshold limits to impose on contractors. As part of this baseline understanding, passive acoustic monitoring should be conducted in the CCZ to gain a better sense of which ambient noise levels and which megafauna species are found in all levels in the water column in the CCZ.

¹⁴¹ UNCLOS, Art. 1(4); Firestone & Jarvis, *supra* note 128, at 124.

¹⁴² Firestone & Jarvis, *supra* note 128, at 124.

¹⁴³ Firestone & Jarvis, *supra* note 128, at 124.

¹⁴⁴ Draft Regulations, Reg. 56.

¹⁴⁵ MIDAS, COMPILATION OF EXISTING DEEP-SEA ECOSYSTEM MONITORING TECHNOLOGIES IN EUROPEAN RESEARCH AND INDUSTRY: ASSESSMENT OF APPLICABILITY AND IDENTIFICATION GAPS 144 (2015).

(2) Mandate that contractors use the most advanced technology with the least noise impact for deep-sea mining.¹⁴⁶

(3) Employ measures at the sea surface level to mitigate noise impact on species. At a minimum, this should include using passive acoustic monitoring to detect acoustically active species and requiring mining activity to cease when these species are within a set distance from mining activity that is calculated by experts in marine mammal acoustics.

(4) Factor cumulative noise impacts into environmental assessments and management frameworks. The ISA has stated that it seeks to incorporate ocean noise into its Environmental Management and Monitoring frameworks.¹⁴⁷ One approach to accomplishing this goal is to set quantifiable noise thresholds at the sea surface and other stages of the water column. Ocean noise will travel across lease blocks and the ISA must be proactive to ensure that cumulative noise impacts are accounted for in planning, assessment, and mitigation.

(5) Establish the “Seabed Mining Sustainability Fund” referenced in the Draft Regulations¹⁴⁸ and include analysis of impacts related to ocean noise as a research objective. This would represent one of the first opportunities to study the effects of ocean noise and vibration from operational equipment on the seafloor.

E. Social, Cultural, and Community Impact Assessment of Deep-seabed Mining Activities

Consistent with the common heritage principle, exploitation of the Area must occur in a manner that preserves important social and cultural resources. In this respect, the socio-cultural and socio-environmental concerns associated with terrestrial mining extend to the marine environment. The risks and negative impacts to social, cultural, and economic systems must be investigated to determine how activities will affect coastal communities, commercial and artisanal fisheries, Indigenous Peoples, and others connected to marine resources.

The ISA must consider the potential disruption by seabed mining of cultural practices from the loss of ecosystem services and ecosystem function, as well as the potential impact to economically valuable species such as tuna, sharks, and other migratory species. Many Indigenous Peoples and other coastal communities depend directly on the ocean for food security, and the ocean is a critical part of their cultural identity.¹⁴⁹ Other potential negative social issues can arise due to the development of ports, transportation, mooring of mining vessels, storage of equipment and extracted minerals, and deep-water pollution. Lastly, the ISA should consider the impact of bioaccumulation of toxins throughout the food web and how this will affect communities around the world.

The current Draft Regulations nest the evaluation and mitigation of social impacts within the Environmental Impact Assessment and the terms of the Environmental Scoping Report. Part X of the Draft Regulations lacks important details regarding the management of social and cultural resources. In parallel, Draft Regulations 20 and 21 indicate that the Environmental Scoping Report and the Environmental Impact Statement will include the “identification (preliminary) of the anticipated environmental, social and cultural

¹⁴⁶ See generally *id.* (reviewing the best available technology, as well as technological gaps in deep-sea mining).

¹⁴⁷ Draft Regulations, p.88.

¹⁴⁸ *Id.* at 73.

¹⁴⁹ Daniel C. Dunn, *et al.*, Adjacency: How Legal Precedent, Ecological Connectivity, And Traditional Knowledge Inform Our Understanding of Proximity, NEREUS PROGRAM, at 2–9 (2017), <http://www.nereusprogram.org/category/policy-briefs/>.

impacts”¹⁵⁰ and will include “a risk assessment of the nature, extent, duration, probability and significance of the identified potential environmental, social, and cultural impacts.”¹⁵¹ However, the Draft Regulations fail to indicate how this process will be carried out, by whom, and with whom.

The ISA should refer to the United Nations Declaration on the Rights of Indigenous Peoples (“UN DRIP”)¹⁵² for guidance regarding the protection of and right to access such resources. Article 26 is particularly relevant as it states that Indigenous Peoples “have the right to the land, territories and resources which they have traditionally owned, occupied, or otherwise used or acquired.”¹⁵³ In addition, Article 29 states that Indigenous Peoples have the right “to the conservation and protection of the environment and the productive capacity of their lands or territories or resources.”¹⁵⁴ Increased social science research on the implications and impact of deep-sea mining on human community dynamics is critical moving forward. It is also important for the ISA, contracting parties, and sponsoring States to inform all people of negative impacts to resources and to compensate various community groups for the potential loss of resources.

Established terrestrial mining companies have acknowledged the need for free and informed consent. This is evident by their endorsement not only of international conventions like UN DRIP independently or through the International Council on Mining and Metals, but also from their incorporation of these policies into corporate social responsibility obligations. This need is potentially of even greater importance when permitting applicants to engage in mineral extraction in the Area. In the deep-seabed mining context, these considerations extend beyond immediately apparent indigenous people to any person who may be affected. Language that ensures the compliance of non-contracting and non-party states merits consideration and may warrant inclusion as a requirement for an application to be considered complete prior to assessment by the LTC.

Thus, we ask that the ISA consider these suggestions regarding the implementation of Social Impact Assessments:

(1) Require Social Impact Assessments alongside Environmental Impact Assessments and Environmental Scoping Reports. This will allow the ISA to anticipate, avoid, minimize, and compensate for any negative social and community impacts by assessing, managing, and monitoring unexpected impacts throughout the project’s lifecycle. Increased social science research on the implications and impact of deep-sea mining on human community dynamics is integral moving forward.

(2) Collect baseline data depicting the prevailing environmental, social, economic, and political environments at appropriate levels of detail to allow for the development and application of effective mitigation measures. This assessment must also consider how environmental impacts during all stages of the project lifecycle (from exploration, exploitation, and beyond) will affect community well-being until the ecosystem fully recovers.

(3) Require applicants to undertake Social Impact Assessments *prior* to the exploration phase of any project and in tandem with the baseline assessment. Follow established protocols for

¹⁵⁰ Draft Regulations, Reg. 20.

¹⁵¹ *Id.*, Reg. 21.

¹⁵² *United Nations Declaration on the Rights of Indigenous Peoples*, G.A. Res. 61/295, U.N. GAOR, 61st Sess., 107th plen. mtg., U.N. Doc. A/RES/61/295 (Sept. 13, 2007) [*hereinafter* U.N. Declaration on Indigenous Rights].

¹⁵³ *Id.*

¹⁵⁴ *Id.*

free, prior and informed consent¹⁵⁵ of Indigenous Peoples, local communities, and all other human groups that may potentially be affected by the direct and indirect impacts of deep-sea mining.

(4) Ensure effective procedures for stakeholder consultation, review, and comment throughout the application process. Informed decision-making processes should seek input from local communities and other potentially affected groups.

F. Cumulative Impacts

The issues addressed above pose substantial risks individually, yet the analysis of cumulative impacts is also critical to a comprehensive analysis of the risks created by deep-sea mining. We applaud the ISA for including cumulative impacts in the Draft Regulations,¹⁵⁶ but ask that concern for cumulative impacts be incorporated throughout the regulations as an important cornerstone of the precautionary principle. It is critical that analysis of cumulative impacts be a component of all information collection, evaluation, and sharing requirements to ensure that planning processes take these impacts into account. The cumulative impacts should be incorporated into the following provisions:

- **Regulation 21, Environmental Risk Assessments**, when evaluating the significance of potential risks, and the uncertainty around the risks of Exploitation Activities. When making decisions about whether a risk is significant, or whether more data are needed to assess significance, the ISA must consider the combined impacts from all sources, not just from a single mining activity. Likewise, when making decisions about whether risks are Acceptable without further Mitigation, risk assessment should be based on the cumulative impacts from all sources, not on a single mining operation.
- **Alternatives, Mitigation, and management measures**,¹⁵⁷ when assessing alternatives, mitigation, and management measures, when selecting the Best Practicable Environmental Option, when assessing the Residual Environmental Impact, and when developing a monitoring program.
- **The Authority's right to request separate Environmental Plans by Mining Area**,¹⁵⁸ when deciding whether impacts will be sufficiently similar to permit a single plan.
- **Requirements for Environmental Management System**,¹⁵⁹ when setting Environmental Targets and evaluating Environmental Performance.
- **Information requirements for the Environmental Management and Monitoring Plan**,¹⁶⁰ when setting environmental objectives, assessing potential impacts and their significance, and identifying appropriate Preservation Reference Zones and Impact Reference Zones.
- **Evaluation Report to the Council**,¹⁶¹ when describing unavoidable adverse impacts, evaluating whether all necessary mitigation measures have been incorporated into mining plans, evaluating

¹⁵⁵ See U.N. Declaration on Indigenous Rights, Articles 20, 28.

¹⁵⁶ See e.g., Draft Regulations, Reg. 20 (environmental scoping); *Id.*, Reg. 26 (Environmental Impact Statements); *Id.*, Reg. 27 (information requirements); *Id.*, Reg. 41 (matters to be considered by the commission); *Id.*, Reg. 47 (Evaluation Report to the Council); *Id.*, Reg. 49 (substantive review of environmental performance).

¹⁵⁷ *Id.*, Reg. 22.

¹⁵⁸ *Id.*, Reg. 24.

¹⁵⁹ *Id.*, Reg. 28.

¹⁶⁰ *Id.*, Reg. 30.

¹⁶¹ *Id.*, Reg. 47.

uncertainty and knowledge gaps, and describing the adequacy of the environmental plans.

- **Modification of the Environmental Plans,**¹⁶² when modification of Environmental Plans is necessary to account for cumulative impacts from mining activities and other sources.
- **Social and cultural management,**¹⁶³ when evaluating social and cultural effects of mining activities.

The ISA should make clear that consideration of cumulative impacts is not limited to “other mining activities”¹⁶⁴ or “other projects.”¹⁶⁵ Cumulative impacts should be determined along with direct and indirect impacts against an established baseline and should include the affected resource, ecosystem, and community. Accurate analysis requires expanding geographic boundaries and extending the timeframe to encompass additional effects on resources, ecosystems, and human communities. Ecosystem-wide impacts from multiple events across the entire area (including areas within national jurisdictions) must be determined. This includes consideration of impacts from multiple disturbances (including fisheries, the oil and gas industry, ocean infrastructure, and waste disposal), and from additional stressors such as climate change and ocean acidification.¹⁶⁶

Cumulative impacts analysis must also determine the long-term risks associated with bioaccumulation of toxic heavy metals within trophic levels. It must identify where a reduction in species diversity and abundance is likely to occur and the likely ecological and socioeconomic effects of these reductions. Cumulative impacts analysis should consider impacts under predicted and worst case scenarios in accordance with the precautionary approach. To properly evaluate cumulative impacts, the ISA should establish systems for sharing information on environmental factors and impacts between mining companies, the ISA, and independent researchers. Finally, as much as possible, the ISA should coordinate with other global and regional bodies regulating fishing, the oil and gas industry, waste disposal, and other sources of marine and coastal impacts to improve consistency and plan for future cumulative impacts.

V. THE DRAFT REGULATIONS SHOULD BE REVISED TO INCLUDE MEASURES THAT PROMOTE CAUTION, TRANSPARENCY, STRATEGIC MANAGEMENT, AND INFORMATION DISSEMINATION.

As discussed in Section I above, the Clinic urges the ISA to refrain from permitting seabed mining in the Area until additional baseline information is gathered and a standardized monitoring and mitigation framework is in place. We also urge the ISA to develop a more streamlined, robust, and adaptive environmental monitoring and assessment regime. We applaud the ISA for identifying and commenting on many of these frameworks in the Draft Regulations, such as environmental assessments and references to mitigation standards.

To better understand, mitigate, and prevent catastrophic damage to the seafloor and wider marine environment, the ISA must incorporate the following measures into the Regulations: baseline ecological studies, strategic environmental management plans, protected areas, impact and preservation reference zones, environmental review procedures, best practices, ecosystem based management, mitigation

¹⁶² *Id.*, Reg. 48.

¹⁶³ *Id.*, Part X.

¹⁶⁴ *Id.*, Reg. 41.

¹⁶⁵ *Id.*, Section 6.

¹⁶⁶ Eva Ramirez-Llodra, *et al.*, *Man And The Last Great Wilderness: Human Impact On The Deep Sea*, 6 PLOS ONE 1, 3 (2011), available at <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0022588>.

measures, observer coverage, and transparency. Achieving a balance between practical management approaches that prevent long-term harm while enabling the extraction and utilization of deep-sea mineral resources is both a difficult challenge and an urgent priority. Thus, this section suggests methods to improve various monitoring frameworks proposed in the Draft Regulations.

A. Environmental Baseline Assessments

The ISA's awareness of the difficulties of crafting clear and specific regulatory language is evident in the Draft Regulations. For example, the ISA acknowledges that "a common understanding of what constitutes or how to define 'serious harm' . . . continues to elude the broad stakeholder base," and that "[t]here is no one single component that will define serious harm."¹⁶⁷ Despite these challenges, specificity is particularly important for the environmental baseline analysis of each site. The Draft Regulations currently rely on the applicant to document the ecological characteristics of each site and develop a baseline study; at a minimum, the ISA must ensure that this information is complete and standardized to inform adequate impact analysis. The regulations should also provide detailed model baseline assessments that contractors can use to prepare accurate environmental plans. This will enable all stakeholders to better anticipate impacts.

Baseline assessments should be completed before granting leases for exploration and exploitation and should be conducted by independent scientific experts, and reviewed by independent expert panels. We believe it is necessary for all baselines to use established and standardized approaches for the collection, management, analysis, and storage of all data. The geographic coverage of baseline data collection should include areas directly and indirectly impacted by the drilling, mining, waste/tailing disposal and plumes, as well as comparable reference areas well outside the range of any expected impacts to analyze how the system changes after mining. Data collection for baseline assessments must include four major categories of data collection, specifically physical and geographic information, geophysical characteristics, biological information, and the potential impacts to human communities.

Box 2. Minimum scientific criteria for Baseline Assessments

Physical Information

- Current speed and direction across water column
- Salinity, pH, hypoxia, nutrient loading, water circulation, and stratification
- Temperature
- Production of detailed bathymetry maps
- Assessment on the potential concentration, settling behavior, toxicity, and dispersal of operational plumes

Geological Information

Data regarding geophysical characteristics of the seafloor shall include:

- Identification of seamounts, active and inactive hydrothermal vents, cold water coral reefs, deep sea trenches and canyons, polymetallic nodules, cold seeps and pockmarks, oxygen minimum zones, abyssal plains, and all other open ocean features

¹⁶⁷ See Draft Regulations, pp.9–10.

Biological Information

Data should be collected regarding the productivity, conductivity, and diversity of the ecosystem and its relationship to global processes. Information gathered should also assess the recovery and resiliency of the ecosystem from direct and indirect impacts. Data collection should include:

- Biomass, primary productivity and nutrient cycling
- Carbon sequestration and link to global climate cycle
- Upwelling potential of mined and waste disposal sites
- Species richness and diversity, degree of endemism, abundance, distribution, range, and rarity, including all megafauna, macrofauna, meiofauna, and microbes
- Identify and characterize existing knowledge of all fauna in the area, with attention given to species identified as endangered or threatened by the International Union for the Conservation of Nature (IUCN)
- Assessment must include effects on behavior of surface marine mammals, fish and birds due to changes in water composition, clarity, lighting, and noise from vessel activity
- Information on impacts from expected plume discharges and associated effects on pelagic and benthic fauna at various depths
- Community dynamics and trophic structures:
 - Food webs
 - Adaptation rates
 - Rarity
 - Recolonization rates and recruitment processes
 - Critical tolerance threshold of species to concentration of particulates
 - Genetic diversity and distribution

Considerations for Human Community

- Complete Social Impact Assessment. See section IV of this report.

B. Strategic Environmental Management Plans

In the CCZ, attempts to develop a robust network of exclusion areas to protect the most ecologically important places have been hampered by the exploration leases that had already been established.¹⁶⁸ In 2003, there were seven leases in place—five years before the ISA released its initial report on the area’s biodiversity, and nine years prior to approval of an environmental management plan for the region.¹⁶⁹ In this plan, the ISA explicitly states that one of that plan’s goals is to avoid overlap between the exclusion areas and the leases.¹⁷⁰

¹⁶⁸ Gjerde & Rulksa-Domino, *supra* note 8, at 367; Rayfuse, *supra* note 8, at 780.

¹⁶⁹ See Glover & Smith, *supra* note 116, at 230; BIODIVERSITY IN THE ABYSSAL PACIFIC NODULE PROVINCE, *supra* note 91. International Seabed Authority Council, *Decision of the Council Relating to an Environmental Management Plan for the Clarion-Clipperton Zone*, ISBA/18/C/22 (July 26, 2012), available at https://www.isa.org.jm/sites/default/files/files/documents/isba-18c-22_0.pdf [*hereinafter* Commission, *Decision Relating to an Environmental Management Plan*].

¹⁷⁰ International Seabed Authority Legal and Technical Commission, *Environmental Management Plan for the Clarion-Clipperton Zone*, ISBA/17/LTC/7, 11 (July 13, 2011), available at https://www.isa.org.jm/sites/default/files/files/documents/isba-17ltc-7_0.pdf [*hereinafter* Commission,

Consistent with our recommendation to develop baseline data prior to issuing permits, preliminary decisions about which areas to exclude from deep-seabed mining must be made *prior* to considering leases, Environmental Impact Statements, or alternatives. The Draft Regulations do not address how this process will occur. They state that Impact Reference Zones (“IRZs”), Preservation Reference Zones (“PRZs”), and areas in which no exploitation shall occur should be based on a SEMP.¹⁷¹ Setting aside areas of high ecological value is essential to protect the common heritage of humankind, while IRZs and PRZs play a valuable role in establishing scientific baselines for the effects of deep-sea mining. Thus, it is essential that SEMP be completed before leasing decisions are made.

Unfortunately, in the case of the CCZ, this approach was not followed and decisions about Areas of Particular Ecological Interest (“APEI”) (where mining would not occur) were made *after* exploration leases were granted.¹⁷² Thus, reluctance to disturb leases has prevented the ISA from establishing reserved areas in an optimal manner to protect ecological hotspots in the CCZ.¹⁷³ To avoid this problem in the future, the ISA must ensure that thorough SEMP are prepared prior to the onset of leasing activities. For each region, the ISA should prepare plans or designate independent scientific bodies to do so. SEMP should establish a protected area network for each region and include regional implementation guidelines for establishing PRZs and IRZs, as well as the environmental objectives, targets, and metrics for each region. To be effective, the ISA should spell out the required components of each SEMP, establish guidelines for engaging stakeholders, mandate transparency, and provide a description of the review and approval process. The SEMP guidelines allow flexibility in implementation, while ensuring overall consistency in approach between different regions.

C. Protected Areas

As part of the process for developing Strategic Environmental Management Plans, the ISA or appropriate regional bodies should establish a protected area network for each region. These plans should designate excluded areas based on clear procedures, perhaps resembling the procedures used to establish Marine Protected Areas (“MPAs”),¹⁷⁴ Vulnerable Marine Ecosystems (“VMEs”), and Ecologically or Biologically Significant Areas (“EBSAs”).¹⁷⁵ Protected areas should be designated or reviewed by independent scientific bodies and based on the best available scientific evidence and practices.

At a minimum, protected areas must cover the most ecologically important areas; safeguard species biodiversity, abundance, and connectivity; provide for recolonization of impacted areas; and protect important social, cultural, and economic resources from mining impacts. The entire protected area network (regional and global) should be considered to account for connectivity between species in different regions and to allow for faster recolonization of the mined areas. Unlike the APEIs (which must be reauthorized every five years),¹⁷⁶ these areas should be permanent and revisions should be permitted only when necessary to improve protection of the region’s natural and cultural resources. SEMP should establish protected areas based on the best available scientific evidence before opening the Area for mining exploration activities.

Environmental Management Plan].

¹⁷¹ Draft Regulations, Annex III.B.10; *Id.*, Reg. 16.

¹⁷² Gjerde & Rulskja-Domino, *supra* note 8, at 367; Rayfuse, *supra* note 8, at 780.

¹⁷³ Gjerde & Rulskja-Domino, *supra* note 8, at 367; Rayfuse, *supra* note 8, at 780.

¹⁷⁴ As recommended by the ISA. See BIODIVERSITY IN THE ABYSSAL PACIFIC NODULE PROVINCE, *supra* note 91, at 2.

¹⁷⁵ Jeff A. Ardron, *et al.*, *A Systematic Approach Towards the Identification and Protection of Vulnerable Marine Ecosystems*, 49 MARINE POL’Y 146, 148 (2014).

¹⁷⁶ Commission, Decision Relating to an Environmental Management Plan, *supra* note 169, at 2.

D. Impact Reference Zones and Preservation Reference Zones

Strategic Environmental Management Plans require protocols for designating Impact Reference Zones and Preservation Reference Zones.¹⁷⁷ Accepted scientific procedures must be used to ensure that monitoring can effectively assess the impacts of mining. First, PRZs need to be geophysically and ecologically comparable to IRZs. Secondly, PRZs should be established in areas removed as much as possible from direct and indirect mining impacts. In addition, adequate replication can ensure statistically valid results from monitoring protocols. Finally, a system should be established between mining companies to coordinate the placement of IRZs and PRZs to maximize the scientific benefits of these programs.

Monitoring sites must be established in protected areas following the same scientific protocols and in coordination with research on IRZs and PRZs to assess impacts based on locations far removed from all predicted mining impacts. Protocols should be written into the ISA's exploration and exploitation regulations. However, if regional differences make this difficult, the ISA needs to establish a general framework to ensure that appropriate IRZ/PRZ protocols are established in each region. The Draft Regulations leave the placement of IRZs and PRZs to the SEMP.¹⁷⁸ In the CCZ environmental management plan, the only requirement on the placement of IRZs is that the area is being mined.¹⁷⁹ Contractors were "encouraged" to collaborate with each other and with independent experts, but this is not a requirement.¹⁸⁰ The ISA should require, rather than encourage, collaboration to establish a scientifically useful network of reference zones throughout the region. Draft Regulation 30(g) could provide additional requirements for applicants on the factors to consider in the establishment of IRZs and PRZs when making these decisions.

E. Environmental Review Procedure

A fundamental goal of effective environmental regulations is to establish a clear procedure for environmental review of proposed projects. A clear procedure allows contractors and scientists to analyze potential impacts against specifically identified goals and develop their applications and comments efficiently. The current Draft Regulations, however, disperse the procedure of environmental review throughout various plans and assessments without adequately clarifying how these assessments are interrelated, without explaining whether they are separate sections of a single environmental assessment submitted in a work plan, and without specifying the goal for each section.¹⁸¹

For example, Draft Regulation 20 provides that an applicant "may" submit an Environmental Scoping Report and articulates the specific contents it would include, such as a "description of the proposed activities and [the Report's] *environmental* objectives," an "identification of the likely Environmental Impact Area," a "description of the existing status of the Marine Environment in the Environmental Impact Area," and identification of anticipated environmental social, and cultural impacts, including cumulative impacts.¹⁸² It is unclear how identification of the impact area is related to the Environmental Impact Area

¹⁷⁷ Draft Regulations, Annex III.B.10.a.

¹⁷⁸ Draft Regulations, Part VII, Management Objectives: B.41.c.

¹⁷⁹ Commission, Environmental Management Plan, *supra* note 170, at 12.

¹⁸⁰ *Id.*

¹⁸¹ These range from an Environmental Impact Assessment (Reg. 17), identification of the Environmental Impact Area (Reg. 18), establishment of an adequate Environmental Baseline (Reg. 19), an Environmental Scoping Report (Reg. 20); an Environmental Risk Assessment (Reg. 21), and a determination of alternatives, mitigation, and management measures (Reg. 22). Additionally, Part IV also requires an Environmental Plan (Reg. 24); an Environmental Impact Statement (Reg. 26); an Environmental Management System (Reg. 28); and Environmental Management and Monitoring Plans and Closure Plans (Regs. 29–32).

¹⁸² Draft Regulations, Reg. 20(2)(a)-(e).

requested in Draft Regulation 18. It is also unclear why the scoping report is phrased permissively—an applicant “may” submit one—while the impact area of Draft Regulation 18 “shall” be undertaken. The Draft Regulations fail to explain how the “Environmental Impact Assessment process” mentioned in Draft Regulation 18 differs in substance and objectives from the “Environmental Assessment” in Part III,¹⁸³ the “Environmental Risk Assessment” in Draft Regulation 21,¹⁸⁴ and the “Environmental Impact Statement” in Draft Regulation 26.¹⁸⁵ It appears that some of these regulations could be specific items requested as part of an application, and others could be the regulatory standards governing the contents or validity of those items. If so, there is significant opportunity to clarify and streamline the current Draft Regulations by depicting the intended process of application and environmental review.

The Clinic recommends that the ISA separate the draft provisions into those that (a) delineate the overall process of application *submission*, specifically the required content for the documents that each contractor must prepare and submit, and (b) describe the standards of application *review and approval*, specifically the requirements for what the contents of the application must analyze and achieve. The ISA should clarify the timeline of submission and review, identifying at what point public comments are invited and considered, when the LTC and ISA expect to review and approve the applications, and under what timeframe the ISA will continue to monitor and evaluate the contractor during the life of a project.

As currently written, the Draft Regulations anticipate review and response times that are unrealistic for an agency with limited resources staffed by a core group of individuals with constrained schedules.¹⁸⁶ In order for applicants to provide coherent and thorough applications and for the scientific community to effectively review those applications, the ISA must ensure that all the risk assessments, impact statements, and other analyses it demands are differentiated by the intended subjects of study, and that the appropriate standards of approval are used for specific environmental protection goals. Finally, a mechanism is needed for interested persons or adjacent states to appeal or challenge a work authorization when and if flaws in the environmental review process described above appear, or new information contradicting an analysis arise.

F. Best Practices for Environmental Assessments and Environmental Impact Statements

As discussed in Section IV, above, there are a wide range of potential direct, indirect, and cumulative impacts from mining operations. As the Authority is aware, the purpose of environmental assessments (“EAs”) and environmental impact statements (“EISs”) is to mitigate harm to the marine environment and reduce the chance of adverse environmental impact. As an initial matter, in light of the harm expected to result from seabed mining, the Clinic is of the view that an EIS (rather than an EA) is more often likely to be the approach required by the precautionary principle. At the same time, the Clinic recognizes that EAs can provide the framework for decisions on EISs, and that EAs should promote accountability and transparency.¹⁸⁷ Furthermore, we agree that much remains to be done in terms of developing guidelines and consistent approaches.

However, several issues should be clarified with respect to the procedures the ISA has proposed in the Draft Regulations. The Draft Regulations state that “[a]n Applicant shall conduct, or has conducted, an

¹⁸³ See Draft Regulations, p.30.

¹⁸⁴ See *id.*, p.35.

¹⁸⁵ See *id.*, p. 39.

¹⁸⁶ See Draft Regulations, Reg. 33 (“The Authority shall review the Environmental Plans within 60 days of receipt of an application for approval of a Plan of Work.”); *Id.*, Reg. 43 (“Within 30 days of receiving the final plans, the Authority shall: (a) determine the plans meet the criteria and requirements determined by the Council, based on the Commission’s recommendations, and is approved.”).

¹⁸⁷ *Id.*, Reg. 10.

Environmental Impact Assessment based on sound engineering and economic principles, conducted and prepared according to Good Industry Practice.”¹⁸⁸ The term “Good Industry Practice” is nebulous, as there is no set industry practice in this area. We encourage the ISA to resolve this concern.

The Clinic agrees with the preparatory framework articulated in Draft Regulation 26. However, as with the EAs, more specific definitions are necessary, such as the definition of “Good Industry Practice” and the meaning of “relevant and sufficient information” in this context.¹⁸⁹ Furthermore, the ISA is currently missing key information that was expected to come out of the Berlin Workshop in March 2017,¹⁹⁰ and we assume the ISA will promptly remedy this gap once that information becomes available. In all events, the Clinic recommends the use of the following best practices and standards to guide the development of sound and effective EAs and EISs.

(1) Define key differences between the EA and EIS, and explain how the two will complement each other. The ISA appears to recognize that an EA should inform whether an EIS is required and we agree that this process should be based on the National Environmental Policy Act (“NEPA”) process in the United States, in which EAs are sometimes relied upon to determine the need for EISs.¹⁹¹ However, we expect that in many instances, the potential for significant adverse change will be great enough that the ISA will advise the applicant to forego the EA and proceed directly to the preparation of a full EIS. For this process to safeguard the marine environment, the ISA should clearly define key goals and approaches for each regime.

(2) Articulate specific subject requirements, editorial and stylistic processes, and a general format for EAs and EISs. Specific, uniform requirements will streamline the ISA’s review of these documents and allow it to more effectively compare EAs/EISs and ensure that all States and contractors are applying the precautionary approach.

(3) Timelines should be established for the ISA’s review, comment, and approval of EAs and EISs. The Draft regulations provide no guidelines for to ensure the ISA’s timely review of such documents. A mandated review timeline will help make the process more efficient and effective for all stakeholders.

(4) Both EAs and EISs should describe, analyze, and predict cumulative impacts. Incorporating cumulative impacts into this framework will allow the ISA and contractors to apply the most effective mitigation measures throughout the mining process to minimize harm to the marine environment.

G. Ecosystem-Based Management

The ISA has stated that an “ecosystem-based approach” is a “guiding principle” in the structure of Regulations for deep-seabed mining,¹⁹² and assured that this approach will be based on the best available science and will consider “appropriate spatial and temporal scales.”¹⁹³ We commend the ISA for recognizing the value of an ecosystem-based approach in the management of mining activity as well as the recovery and stability of the deep sea.

¹⁸⁸ *Id.*, Reg. 17.

¹⁸⁹ *Id.*, Reg. 26.

¹⁹⁰ *Id.*, Annex II, p.86.

¹⁹¹ NATIONAL PARK SERVICE, NEPA HANDBOOK 17 (2015), available at https://www.nps.gov/orgs/1812/upload/NPS_NEPAHandbook_Final.pdf.

¹⁹² Draft Regulations, Section III, p.18.

¹⁹³ *Id.*, Regs. 5–6.

Indeed, ecosystem-based management (“EBM”) is gaining widespread attention and is commonly used to manage marine resources. For example, in the United States, the Obama Administration directed federal agencies to incorporate marine spatial planning and ecosystem-based management in National Ocean Policy.¹⁹⁴ EBM departs from conventional, single-sector management and considers management in the context of entire marine ecosystems, including all anthropogenic, biological, and physical factors affecting the ecosystem over varying spatiotemporal scales.¹⁹⁵ Because of the transboundary nature of deep-seabed mining, the level of uncertainty regarding environmental impacts, and the likelihood of cumulative impacts,¹⁹⁶ an ecosystem-based approach to monitoring and managing this activity is vital.

While stating an intent to monitor and manage deep-sea mining via EBM represents an important step, the ISA needs to clarify how it plans to conduct EBM in the Draft Regulations. The following recommendations could help the ISA to better articulate the use of EBM in the deep-seabed mining context:

(1) Marine spatial planning—an essential tool to effective EBM¹⁹⁷—should form the backbone of EBM in the context of deep-seabed mining. More specifically, the ISA should require that marine spatial planning be conducted in each environmental assessment to examine overlaps in industry, ocean users, fauna, and other subjects in the lease area. The ISA should employ Geographic Information System (“GIS”) software to map social, economic, and biological overlap. The ISA should also refer to online data reporting and visualization platforms, like the Ocean Biogeographic Information System, the Biological Information system for Marine Life, and Global Fishing Watch. Finally, key scientific elements to be considered in marine spatial planning are seafloor topography, oceanographic features (i.e., eddies and surface currents), satellite telemetry of megafauna, protected areas, vulnerable marine ecosystems, and evidence of other industrial activity in the ocean.

(2) The specific principles, indicators, and goals of EBM need to be defined in the deep-seabed mining context. A logical place to start in developing this EBM framework is through a literature review on EBM, as many different studies recognize different principles and priorities for EBM,¹⁹⁸ or through reviewing relevant policy documents, such as the U.S. National Ocean Policy mentioned above.¹⁹⁹

H. Mitigation Measures

Mitigation measures are a key strategy for reducing impacts—environmental, social, and cultural—from anthropogenic activity around the world. It is challenging to define and apply mitigation to such a

¹⁹⁴ NATIONAL OCEAN COUNCIL, NATIONAL POLICY IMPLEMENTATION PLAN, app. (2013), available at https://obamawhitehouse.archives.gov/sites/default/files/national_ocean_policy_ip_appendix.pdf [hereafter National Ocean Council Implementation Plan].

¹⁹⁵ Phillip S. Levin, *et al.*, *Integrated Ecosystem Assessments: Developing the Scientific Basis for Ecosystem-Based Management of the Ocean*, 7 PLOS BIOLOGY 23 (2009); L.B. Crowder, *et al.*, *Resolving Mismatches in U.S. Ocean Governance*, 313 SCIENCE 617, 617 (2006).

¹⁹⁶ Benjamin S. Halpern, *et al.*, *Managing for Cumulative Impacts in Ecosystem-Based Management Through Ocean Zoning*, 51 OCEAN & COASTAL MGMT. 203, 204 (2008).

¹⁹⁷ Fanny Douvère, *The Importance of Marine Spatial Planning in Advancing Ecosystem-Based Sea Use Management*, 32.5 MARINE POL’Y 762, 763 (2008).

¹⁹⁸ Katie K. Arkema, Sarah C. Abramson & Bryan M. Dewsbury, *Marine Ecosystem-Based Management: from Characterization to Implementation*, 4 FRONTIERS IN ECOLOGY AND THE ENVIRONMENT 525, 525–32 (2006); Halpern *et al.*, *supra* note 196, at 203–06.

¹⁹⁹ National Ocean Council Implementation Plan, *supra* note 194, app.

poorly understood environment, and we commend the ISA for being proactive and referencing its importance throughout the mining process.

Box 3. Reference to Mitigation Measures in Draft Regulations.

- The ISA finds that the Environmental Scoping Report should contain “Identification and use of mitigation measures.”²⁰⁰
- Environmental Risk Assessments must ensure that: “The burden of proof is on an Applicant to demonstrate that the risk of the Environmental Impacts, and consequential Mitigation and management thereof, will meet the Environmental Objectives of the Authority and that the Plan of Work is environmentally Acceptable.”²⁰¹
- Environmental Impact Statements must include “a determination of the appropriate mitigation measures that are technically and economically feasible for each potentially significant adverse impact of the proposed Exploitation Activities to prevent, reduce and offset such impacts”²⁰² and “identification of the management and Monitoring measures, including appropriate Environmental Targets” (environmental indicators 51), to both Monitor the effectiveness of the Mitigation measures.”²⁰³
- Environmental Management and Monitoring Plans must contain: “a summary of the assessment of the significance of the potential environmental impacts and the proposed mitigation measures and management control procedures.”²⁰⁴
- Substantive review of Environmental Performance should discuss, “any recommendations as to variations in Monitoring and/or Mitigation measures to ensure that effective environmental Monitoring and Mitigation measures are maintained under the Environmental Management and Monitoring Plan.”²⁰⁵
- Finally, in Adherence to Contract: “The Mitigation measures contained in the Environmental Management and Monitoring Plan shall be implemented at the correct time, in the correct way and at the correct place.”²⁰⁶

This recognition is a starting point for considering mitigation measures, but references to mitigation in the Draft Regulations are ambiguous and appear to allow the State or Contractor to develop, assess, and enforce its own mitigation standards. The current discussion on mitigation measures in the Draft Regulations provides significant latitude for minimal and ineffective mitigation measures that vary from contractor to contractor.

Furthermore, there are significant gaps to address to ensure that mitigation measures are adequately employed and assessed. For example, Draft Regulation 51 states that “[t]he Mitigation measures contained

²⁰⁰ Draft Regulations, Reg. 20.

²⁰¹ *Id.*, Reg. 21.

²⁰² *Id.*, Reg. 32.

²⁰³ *Id.*, Reg. 32.

²⁰⁴ *Id.*, Reg. 30.

²⁰⁵ *Id.*, Reg. 49.

²⁰⁶ *Id.*, Reg. 51.

in the Environmental Management and Monitoring Plan shall be implemented at the correct time, in the correct way and at the correct place,”²⁰⁷ but the ISA fails to identify when, where and how to implement mitigation measures correctly. As a result, it is not clear how the ISA will ensure enforcement in a remote environment like the deep seabed.

To remedy the ambiguity and potential for increased harm from contractor-driven mitigation measures, the Clinic proposes the following mitigation standards and processes:

(1) Develop a set standard for industry-wide mitigation measures that all Contractors must follow, specific to each of the four types of mineral extraction. This will ensure that the deep-sea environment is afforded a certain standard of protection throughout the activity. At minimum, the ISA should consider the following mitigation standards:

- On-board vessel observers to maintain vigilant watch for protected species from all operator vessels and to avoid vessel strike during the daylight hours;
- Remotely Operated Vehicle (“ROV”) and video footage monitoring of seafloor and mid-water column operational activity;
- A robust framework of Marine Protected Areas to minimize overlap of activity, create barriers for plume transfer, allow for faster recovery of impacted areas, and reduce cumulative impacts;
- Passive acoustic monitoring from the main operator vessel to detect megafauna near the mining site;
- Limitations on mining intensity and duration, to reduce cumulative impacts;
- Contractors shall be required to submit bi-weekly monitoring reports to the ISA.

(2) Conduct visual monitoring to ensure compliance with mitigation standards. Visual monitoring of activity at the seafloor, in the water column, and at the surface should be conducted continuously. Without an observer coverage program in place, one that includes video monitoring and human coverage, there is no incentive for Contractors to follow required mitigation standards.

(3) The ISA should refer to best practices for mitigation within other industries. The ISA has made progress on this by referencing the United States’ NEPA definition for mitigation in the implementing regulations.²⁰⁸ In addition to NEPA, we recommend that the ISA review the U.S. Bureau of Ocean Energy Management’s (“BOEM”) Notices to Lessees and Operators documents,²⁰⁹ particularly documents pertaining to “Vessel Strike Avoidance and Injured/Dead Protected Species Reporting” and “Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program,” as examples of an approach to communication between an agency and contractors and mitigation standards used in the oil and gas industry. Other worthy examples of mitigation are recent recommendations for seismic surveys and mitigation measures made by the International Union for the Conservation of Nature (“IUCN”),²¹⁰ and those by the Joint Nature Conservation Committee (“JNCC”)²¹¹ for seismic surveys in UK waters.

²⁰⁷ *Id.*

²⁰⁸ *Id.*, p.98; C.F.R. § 1508.20 (laying out the regulations for the implementation of NEPA).

²⁰⁹ Bureau of Ocean Energy Management, *Notice to Lessees and Operators* (2017), <https://www.boem.gov/Notices-to-Lessees-and-Operators/>.

²¹⁰ Douglas P. Nowacek & Brandon L. Southall, *Effective Planning Strategies for Managing Environmental Risk Associated with Geophysical and Other Imaging Surveys*, IUCN, 8–38 (2016).

²¹¹ JOINT NATURE CONSERVATION COMMITTEE, JNCC GUIDELINES FOR MINIMISING THE RISK OF INJURY AND DISTURBANCE TO MARINE MAMMALS FROM SEISMIC SURVEYS, at 6–16 (2010), available at http://jncc.defra.gov.uk/pdf/JNCC_Guidelines_Seismic%20Guidelines_Aug%202010.pdf.

I. Observer Coverage

An institutional observer coverage program is essential to ensuring that mitigation measures are implemented and that Contractors operate within the scope of their permitted activity. Observers currently are used to monitor many offshore activities, including commercial fishing and oil and gas exploitation.²¹²

The Draft Regulations provide minimal detail regarding an observer coverage program, though they recognize its significance by stating, “The Regime needs to develop clear and unambiguous contractual obligations, encompassing relevant standards and protocols duly enforced by an inspection/observer schedule (including remote visual/sensors) and cooperation between the Authority and Sponsoring States.”²¹³ Other references to observer coverage do not state specific requirements, and thus lack basic hallmarks of observer programs such as specific requirements for observer training, observer reporting formats, number of observers, and duties of observers.

Given this lack of detail, and the prevalence of other industries that mandate observer coverage, the Clinic recommends that the ISA work towards creating a robust observer coverage program by starting with these basic steps:

(1) Mandate an intensive observer coverage program on all vessels associated with mining activity to carry out three main goals: minimize impacts, increase transparency, and ensure mitigation measures are employed. Given the lack of knowledge about impacts from deep-seabed mining, the observer coverage program should monitor ocean surface-level impacts, including adverse impacts to megafauna from vessel presence and transfer of mined material, as well as impacts at the seafloor. In addition to promoting adequate protection of the marine environment, this level of observation would enhance scientific understanding of the ecology of the deep sea floor, and of impacts threatened by mining of the deep sea floor.

(2) Examine other industries operating on the high seas as examples of how to develop an observer coverage program. At present, many regional fishery management organizations (“RFMOs”) have standing observer coverage programs in place, including Straddling Stock RFMOs and Highly Migratory Species RFMOs.²¹⁴ We recommend that the ISA follow this approach as a general framework, as well as U.S. recommendations for protected species observer coverage in the oil and gas industry.²¹⁵

(3) The integrity of riser pipes and discharge pipes must be continuously monitored. Several methodologies for accomplishing this task are by manual checks via scientific divers up to certain depth limits, by cameras observed in real time, and by remotely operated vehicles to ensure that they are not leaking material or experiencing wear.

²¹² U.S. DEPARTMENT OF COMMERCE, NATIONAL STANDARDS FOR A PROTECTED SPECIES OBSERVER AND DATA MANAGEMENT PROGRAM: A MODEL USING GEOLOGICAL AND GEOPHYSICAL SURVEYS, 2 (2013), available at http://www.nmfs.noaa.gov/pr/publications/techmemo/observers_nmfsopr49.pdf [*hereinafter* U.S. COMMERCE NATIONAL STANDARDS]; SPRFMO, 4TH MEETING OF THE COMMISSION, VALDIVIA, CHILE, 25 TO 29 JANUARY 2016, 1 (2016), available at <https://www.sprfmo.int/assets/Meetings/Meetings-2013-plus/Commission-Meetings/4th-Commission-Meeting-2016-Valdivia-Chile/COMM-04-INF-04-Observer-Programmes-of-RFMOs.pdf> [*hereinafter* SPRFMO 4TH MEETING].

²¹³ Draft Regulations, Reg. 8.1.

²¹⁴ SPRFMO 4TH MEETING, *supra* note 212, at 1.

²¹⁵ U.S. COMMERCE NATIONAL STANDARDS, *supra* note 212, at 2.

(4) Observers should be required to submit bi-weekly monitoring and compliance reports to the ISA. This form of reporting is required in many industries, including observers on seismic survey vessels in the U.S. submitting biweekly reports to BOEM. This allows for continuous monitoring of impacts and creates a record of impacts for future research.

(5) An independent institution should be developed to oversee the observer coverage program. This would require that contractors be hired by an independent body and be audited for ties to the mining industry to avoid observer bias. Similarly, any entity charged with reviewing observer coverage reports should be part of an independent body not associated with Member States or contractors.

(6) Water quality samples should be collected at the seafloor before, during, and after mining operations. Once transferred to the surface, these samples should be examined to determine extent of sedimentation, chemicals, etc. This mechanism can be used to replace actual observers at depths where in-person observation would be impractical.

(7) The use of ROVs and other available technology should be deployed at the sea surface during and after mining to monitor seafloor impacts. Footage should be reviewed by observers continuously so impacts from mining activity are minimized and are not allowed to lead to unanticipated adverse harm.

J. Knowledge Sharing, Transparency, and Public Access

Shared information and transparency are critical to sound decision-making. Shared data are essential for evaluating cumulative impacts; understanding species abundance, diversity, connectivity, and ecology across multiple contract areas; and identifying data gaps and research priorities. In an area as understudied as the deep sea, where most species collected are new to science, it is impossible to develop an understanding of species distribution and prevalence – and thus to properly evaluate potential impacts to them – unless species data are shared among contractors, governing bodies, and the scientific community. Likewise, because environmental impacts can cross leasing lines, data sharing is essential to assign fault or revise environmental practices when environmental targets are not achieved. Scientists should also share information on methods and procedures, so that results can be accurately compared across contract areas. Sharing information is also important in the planning process, such as in establishing a network of IRZs and PRZs that are scientifically useful across multiple mining activity areas. Currently, Draft Regulations 9 through 11 promote uniform formats in reporting data, accountability and transparency in general terms, and cooperation between parties and the ISA. However, they do not spell out what types of data should be shared, between whom, and in what time frame.

Clear guidelines should be established for knowledge sharing among mining companies, the public, and sponsoring states to allow for consistency in scientific protocols, ensure assessment of cumulative impacts between areas, and to establish greater statistical power when evaluating impacts. The Draft Regulations should clarify who is responsible for reviewing and assessing monitoring data (Draft Regulation 52) and making the data available to outside researchers. Standards should be established for interoperability of data between regions and companies, and parties should be required to share data in a timely manner. An independent expert scientific committee should be established to review data at set increments for each region open to leasing to ensure data is meeting minimum standards for collection methodologies; this would also enable the incorporation of relevant findings into future leasing, monitoring, and mitigation standards, consistent with principles of adaptive management. Such a committee could be modeled on the U.S. Scientific and Statistical Committees that support each regional fishery management

council.²¹⁶

Current platforms relevant to data sharing include: (1) Ocean Biogeographic Information System and (2) Biological Information system for Marine Life. The ISA should be prepared to store large data sets online and examine potential data storage software systems with an eye toward public access.

CONCLUSION

The Clinic applauds the Authority for raising important questions and subjects in the Draft Regulations. However, the overwhelming lack of information concerning the environment of the seafloor, and the fact that mining the seabed will destroy portions of that environment, demonstrate that the ISA must postpone deep-seabed mining until essential baseline information is gathered. The provisions of UNCLOS, the precautionary principle, and customary international law, all underscore the duty of the ISA to postpone any mining activity until it can be more certain that such activity can be accomplished in a manner that protects the Common Heritage of Humankind.

In the event the ISA determines to proceed with efforts to allow seabed mining in the Area, the Draft Regulations provide a starting framework for regulation of that mining. To fulfill the ISA's obligations, however, the Draft Regulations require substantial revision and review. There are significant gaps regarding the permitting procedure, timeline, and content. These gaps must be filled before allowing contractors to move forward. The Draft Regulations must also effectively implement the mandate to take a precautionary approach and preserve the Common Heritage of Humankind. We hope our comments will aid the ISA in clarifying some of these issues, and we welcome further discussion.

²¹⁶ In the United States, all regional Fishery Management Councils have a Science and Statistical Committee, comprised of leading third party biologists, economists, social scientists, and more that help advise the Council general over one year terms (e.g. North Pacific Fishery Management Council, *Science and Statistical Committee*, (2017). Retrieved from: <https://www.npfmc.org/scientific-and-statistical-committee/>). The idea is that this independent review team could help the ISA disseminate, understand, and apply data from the deep-seabed mining context.

APPENDIX
Glossary of Abbreviations

1. AM – Adaptive Management
2. APEI – Areas of Particular Ecological Interest
3. BOEM – United States Bureau of Ocean Energy Management
4. CBD – Convention on Biological Diversity
5. CCZ – Clarion-Clipperton Zone
6. EA – Environmental Assessment
7. EBM – Ecosystem-Based Management
8. EBSA – Ecologically or Biologically Significant Area
9. EIS – Environmental Impact Statement
10. FAO – Food and Agriculture Organization of the United Nations
11. GIS – Geographic Information System
12. IRZ – Impact Reference Zone
13. ISA – International Seabed Authority
14. ITLOS – International Tribunal for the Law of the Seas
15. IUCN – International Union for the Conservation of Nature
16. JNCC – Joint Nature Conservation Committee
17. LTC – Legal and Technical Commission
18. MPA – Marine Protected Area
19. NEPA – United States National Environmental Policy Act
20. PRZ – Preservation Reference Zone
21. RFMO – Regional Fishery Management Organization
22. ROV – Remoted Operated Vehicles
23. SEMP – Strategic Environmental Management Plan
24. UN – United Nations
25. UNCLOS – United Nations Convention on the Law of the Sea
26. UN DRIP – United Nations Declaration on the Rights of Indigenous Peoples
27. VME – Vulnerable Marine Ecosystem