PART 3

Implementing Precaution by the International Seabed Authority

Implementing the Precautionary Principle: Protective Measures

6.1 Introduction

*In spite of the challenges ahead, the Authority [...] has taken measures in the evolutionary manner anticipated by the 1994 Implementation Agreement. It will continue to do so in such a manner that as far as possible deep seabed mining is environmentally sustainable.*¹

Although the preliminary implementation of the precautionary approach by the International Seabed Authority (ISA) through its incorporation into the Mining Code has been examined in the previous chapter, much remains to be said about whether the ISA is implementing the precautionary approach *in practice*. As concluded in Chapters 2.4.1 and 2.5, implementing precaution involves three dimensions: (1) *procedural measures* required to conceptualise and assess the risks of seabed mining in light of scientific advice as balanced against the social, economic, political and environmental values ascribed to seabed minerals and the ecosystems associated with them; (2) tangible *protective measures* to prevent ‘harmful effects’ and ‘significant adverse change’ to the marine environment;² and (3) *institutional capacity* to conduct the risk assessment and give effect to the chosen risk management measures.

The institutional capacity of the ISA is examined in Part II. In particular, Chapter 4 analyses the ISA’s environmental mandate under the *United Nations Convention on the Law of the Sea* (LOSC or Convention)³ and the *Agreement Relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea* (IA).⁴ Chapter 5 examines the manner in which the ISA has

1 Nii Allotey Odunton, ‘Current Developments Related to Mining in the Area and the Work of the International Seabed Authority’ (28 January 2014) <<https://www.isa.org.jm/files/documents/EN/Press/Japan-Jan2014.pdf>>.

2 For a discussion of these terms, see Chapter 5.4.6.1.

3 *United Nations Convention on the Law of the Sea* (adopted 10 December 1982, entered into force 16 November 1994) 1833 UNTS 3.

4 *Agreement Relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea* (adopted 28 July 1994, entered into force 28 July 1996) 1836 UNTS 3.

been gradually developing its environmental obligations primarily through the adoption of the Mining Code.

Building on this discussion, the following Chapters analyse, in detail, the extent to which the ISA is giving effect to the precautionary approach, beyond including it in the Mining Code. To that aim, Chapters 6 to 8 critically analyse the ISA's implementation of the three dimensions of the precautionary principle. The present chapter begins by examining the protective measures which are designed to reduce the risk of activities in the Area causing environmental harm. Even though these are in some way the 'outcome' of the application of the precautionary principle, it is useful to examine them first to demonstrate what the ISA has done to date. This will then allow an analysis in Chapters 7 and 8 of the extent to which the ISA's procedural and institutional structures provide an explanation for the success or failure of the ISA's protective measures.

This chapter examines a range of protective measures relevant to seabed mining. Trouwborst reminds us that any measure can be precautionary so long as it meets the criteria of *effectiveness and proportionality*.⁵ In addition, measures to give effect to the precautionary principle must be taken at an *early stage*, even if uncertainties remain. These three elements, effectiveness, proportionality, and early action, are used as assessment criteria to evaluate the protective measures in relation to the precautionary principle. The protective measures examined are those taken by the ISA or required by the regulatory framework, as well as those measures that could be applicable to seabed mining, as suggested by responses to the ISA's first stakeholder survey in 2014.⁶

To this end, the chapter begins with an examination of the ISA's work with respect to marine scientific research in Section 6.2. Although scientific research is not strictly a protective measure, it is a core ingredient of the precautionary principle and a prerequisite for all protective measures. Section 6.3 then examines the ISA's work on marine protected areas, using as an example the Environmental Management Plan for the Clarion-Clipperton Zone, which incorporates nine areas protected from mining. The discussion also identifies current shortcomings, in particular the lack of multi-purpose marine protected areas, and protective measures associated with them, such as safety margins. Subsequently, Section 6.4 analyses measures pertaining to particularly vulnerable ecosystems and Section 6.5 discusses the control of particular activities

5 Arie Trouwborst, *Precautionary Rights And Duties of States* (Martinus Nijhoff Publishers, 2006), pages 147–156; Chapter 2.3.

6 ISA, *Developing a Regulatory Framework for Mineral Exploitation in the Area: Stakeholder Engagement*, (February 2014) <<http://www.isa.org.jm/files/documents/EN/Survey/ISA-SSurvey.pdf>> (*Stakeholder Survey*). All submissions to the Survey are available at <<https://www.isa.org.jm/survey/March-2014/stakeholder-responses>>.

through a listing method. Sections 6.6 and 6.7 then consider emergency orders and environmental restoration respectively.

6.2 Marine Scientific Research

As set out in Chapter 4.5, the Authority is under an obligation to promote and encourage the conduct of marine scientific research in the Area and coordinate and disseminate the results.⁷ Moreover, the ISA itself may carry out research concerning the Area and its resources.⁸ This is a priority focus under the IA.⁹

Furthering scientific research is an intrinsic aspect of the precautionary principle¹⁰ and affects its implementation in multiple ways. Marine scientific research plays a crucial role in identifying and minimising scientific uncertainties, enhancing knowledge of long-term risk management options,¹¹ and identifying best environmental practices. Additionally, scientific research is relevant for the implementation of the procedural elements of precaution, through assisting in early identification of potential environmental harm and reviewing the continuing suitability of protective measures.

The ISA does not have a dedicated body to coordinate and conduct marine scientific research. Instead, it engages in research in two ways: first, the ISA allocates the requirement to research environmental baseline data at mine sites to contractors; second, the ISA Secretariat co-funds external research projects, commissions technical studies, and organises workshops to collate information from external research. The following Sections examine the ISA's work in relation to research into biodiversity and deep ocean ecosystems.¹²

6.2.1 *Research Regarding Faunal Diversity Associated with Polymetallic Nodules*

As discussed in Chapter 1, scientific research regarding deep ocean ecosystems is inchoate. Thus, it is unsurprising that in the early 2000s, knowledge about the species residing in areas with a high density of polymetallic nodules was

⁷ LOSC, article 143(2).

⁸ LOSC, article 143(2).

⁹ IA, annex section 1(5)(h).

¹⁰ Chapter 2.4.1; Trouwborst (n. 5), pages 174–177.

¹¹ Ellen Hey, 'The Precautionary Concept in Environmental Policy and Law: Institutionalizing Caution' (1992) 4 *Georgetown International Environmental Law Review* 303–318, page 311.

¹² For an overview of the research projects which the ISA has been involved in, see Michael W. Lodge, 'Collaborative Marine Scientific Research on the International Seabed' (2008) 3 *The Journal of Ocean Technology* 30–36.

limited. Against this background, the Kaplan project, financed by the J.M. Kaplan Fund and the ISA, was conducted between 2002 and 2007. The project focused on the abyssal plains of the Clarion-Clipperton Zone (CCZ). Albeit limited by relatively small sample sizes, the project resulted in substantial advances in scientific understanding of the biodiversity in the CCZ.¹³ The project analysed biodiversity levels, species range and gene flow, as well as their recolonisation processes following disturbances. The results indicated 'high, unanticipated, and still poorly sampled levels of species diversity' for all of the three sampled faunal groups.¹⁴ The findings demonstrated that instead of the CCZ being a continuous habitat, biodiversity varies substantially in different geographical locations.¹⁵ The findings enabled the researchers to suggest the establishment of marine protected areas as an option to best manage biodiversity and to identify a number of criteria for designing the areas to ensure protection of the different faunal species across the region.¹⁶ This eventually led to establishment of the Environmental Management Plan for the CCZ, which is discussed in Section 6.3.1 below.

6.2.2 *Research Regarding Ecosystems Associated with Polymetallic Sulphides and Ferromanganese Crusts*

Scientific knowledge over polymetallic sulphides and crusts and ecosystems associated with them was, and still is, even less developed than that for nodules. The ISA has started to address this lack of knowledge, albeit not in a comprehensive manner.

In the context of developing the *Exploration Regulations* for sulphides and crusts in 2003, the Legal and Technical Commission (LTC) noted that 'in order to carry out its responsibilities in relation to the protection and preservation of the marine environment, it was *essential* for the Authority to improve its understanding of seabed and deep ocean environmental processes, including biodiversity.'¹⁷ As recommended by the LTC,¹⁸ the ISA organised a workshop in 2004 to identify specific environmental baseline requirements for sulphides

13 Craig R. Smith et al., *Biodiversity, Species Ranges, and Gene Flow in the Abyssal Pacific Nodule Province: Predicting and Managing the Impacts of Deep Seabed Mining (Technical Study No. 3)* (ISA, 2008), page 29.

14 Ibid., pages 2, 28.

15 Ibid., page 29.

16 Ibid., pages 29–30.

17 ISA, ISBA/9/C/4 (1 August 2003), paragraph 15 (emphasis added).

18 ISBA/9/C/4 (n. 17), paragraph 1.

and crusts deposits respectively.¹⁹ The workshop participants suggested details, which the LTC could incorporate into the guidelines for the requirements of environmental baseline data, such as sampling for 'taxonomic identification, DNA sequencing and voucher collections.'²⁰ The participants also identified the need to gather regional environmental baseline data to be able to determine the ecosystem's sensitivity to local mining activities.²¹ Although the workshop participants noted this requirement in relation to the contractors' obligations, it might be argued that acquiring *regional* baseline data could also be achieved by marine scientific research coordinated by the ISA itself, and perhaps financed by contractors. This would ensure baseline data is collected beyond allocated exploration areas.

In 2006, the ISA organised a further *Workshop on Cobalt-Rich Crusts and the Diversity and Distribution Patterns of Seamount Fauna*²² to identify additional data and information that will be required from contractors in order to establish environmental baselines and associated monitoring programmes. The workshop also highlighted the lack of scientific knowledge in respect of the biodiversity of seamounts that are located in areas of commercial activity.²³ Following both workshops, the LTC concluded in 2006 that there was a 'very limited understanding of the physical, geochemical and biological conditions at potential sites for exploration for those resources', which 'contrasted sharply' with the starting position for polymetallic nodules.²⁴ Participants at a 2006 workshop²⁵ recommended 'major data acquisition programmes' by future contractors to allow for the development of environmental guidelines.²⁶

However, comprehensive data gathering requirements were found to be impractical and a 'significant discouragement' to future contractors.²⁷ In other

19 See <<https://www.isa.org.jm/workshop-establishment-environmental-baselines-deep-seafloor-cobalt-rich-crusts-and-deep-seabed>>.

20 ISA, *Polymetallic Sulphides and Cobalt-rich Ferromanganese Crusts Deposits: Establishment of Environmental Baseline and an Associated Monitoring Programme during Exploration*, Proceedings of the ISA Workshop held in Jamaica (6–10 September 2004) (ISA, 2004), page 423.

21 Ibid., page 424.

22 See <<https://www.isa.org.jm/workshop-cobalt-rich-crusts-and-diversity-and-distribution-patterns-seamount-fauna>>.

23 Lodge (n. 12), page 33.

24 ISA, ISBA/12/C/8 (11 August 2006), paragraph 25.

25 See <<http://isa.org.jm/workshop-mining-cobalt-rich-ferromanganese-crusts-and-polymetallic-sulphides-technological-and>>.

26 ISBA/12/C/8 (n. 24), paragraph 25.

27 Ibid.

words, attracting new contractors was prioritised over setting environmental standards. This is problematic, as the experience with polymetallic nodules demonstrates; Even though the *Nodules Exploration Regulations* benefited from research conducted before the ISA was established, environmental baseline data for nodules mining areas is currently inadequate.²⁸

Despite this lack of data, the ISA is attempting to develop a regulatory framework for the mineral exploitation phase. The starting point with respect to data on polymetallic sulphides and ferromanganese crusts is worse than for nodules, which will only magnify the challenges. Again, one has to wonder why the gathering of baseline data was only discussed in relation to the contractors' obligations. As noted in Chapter 5.4.1.3, by placing the onus of research only on the contractors, the Mining Code has not fully developed the ISA's broad mandate to coordinate and conduct marine scientific research, which is a key element to implementing the Authority's environmental obligations.

Nonetheless, although no major data acquisition programmes were pursued, the ISA has collaborated with the Census of Marine Life on Seamounts, known as CenSeam, a major 10-year research initiative investigating the diversity, distribution, and abundance of marine life.²⁹ The collaboration focused on obtaining new data on seamount biodiversity in the western Pacific Ocean between 2007 and 2009.³⁰ The results were published in the ISA Technical Study No. 8, which developed a detailed set of faunal records from sites in the Hawaiian Archipelago³¹ and identified a number of issues requiring further research.³² These results were confirmed at a follow up workshop organised by the ISA in 2011,³³ where participants made recommendations regarding protective measures for seamounts, in particular marine protected areas and the size and location thereof. The participants noted:

the structure of biological assemblages is significantly different on seamounts located in and outside the cobalt-rich crust region. This means that applying spatial conservation measures only to seamounts outside the region is unlikely to capture the full range of biological features present in the cobalt-rich crust region. If the management objective is to

²⁸ Chapter 7.2.3.1.

²⁹ See <<http://www.coml.org>>.

³⁰ ISA, ISBA/12/A/2 (13 June 2011), paragraph 108.

³¹ Malcolm Clark et al., *Fauna of Cobalt-Rich Ferromanganese Crust Seamounts (Technical Study No. 8)* (ISA, 2011), page 72.

³² *Ibid.*, pages 76–77.

³³ ISBA/12/A/2 (n. 30), paragraph 108.

protect representative ecological communities, seamounts within the cobalt-rich crust region will need to be conserved.³⁴

As of July 2016, the ISA has not developed any protected areas for seamounts, even though five applications for contracts to explore ferromanganese crusts on seamounts have been accepted.³⁵

In parallel to the work on seamounts, the ISA commissioned a study on the management of chemosynthetic ecosystems associated with sulphide deposits. The scientists engaged, whose findings were published in the ISA Technical Study No. 9, reviewed the relative impact of various human activities on vents and seeps and suggested design principles to apply marine spatial planning to chemosynthetic ecosystems and to establish a network of chemosynthetic ecosystem reserves.³⁶ As such, the study identified specific management options and best environmental practices, most notably the creation of marine protected areas. However, as of July 2016, this recommendation has not been discussed further, while six plans to explore sulphides have been accepted.³⁷

6.2.3 Discussion About the ISA's Engagement in Marine Scientific Research

As these examples show, the ISA has actively collaborated in external research projects and has organised regular scientific workshops, the majority of which have addressed environmental considerations.³⁸ Moreover, the ISA has disseminated some of the information in the form of technical studies and workshop reports. However, the ISA has not yet disseminated any research data from contractors,³⁹ although the *Exploration Regulations* specifically classify such data as non-confidential.⁴⁰

34 Thomas A. Schlacher et al., 'Seamount Benthos in a Cobalt-Rich Crust Region of the Central Pacific: Conservation Challenges for Future Seabed Mining' [2013] *Diversity and Distributions* 1–12, page 7.

35 See <https://www.isa.org.jm/deep-seabed-minerals-contractors?qt-contractors_tabs_alt=2#qt-contractors_tabs_alt>.

36 C.L. Van Dover et al., *Environmental Management of Deep-Sea Chemosynthetic Ecosystems: Justification of and Considerations for a Spatially-Based Approach* (Technical Study: No. 9) (ISA, 2011).

37 See <https://www.isa.org.jm/deep-seabed-minerals-contractors?qt-contractors_tabs_alt=1#qt-contractors_tabs_alt>.

38 See <<https://www.isa.org.jm/scientific-activities>>.

39 Seascope Consultants, *Review of Implementation of the Environmental Management Plan for the Clarion-Clipperton Zone* (20 May 2014) <<http://isa.org.jm/files/documents/EN/20Sess/LTC/CCZ-EMPrev.pdf>>, page 10.

40 *Regulations on Prospecting and Exploration for Polymetallic Nodules in the Area*, ISBA/6/A/18 (13 July 2000), amended by ISBA/19/C/17 (22 July 2013), ISBA/19/A/12

As noted at the outset, the role of marine scientific research is to increase the knowledge base regarding the deep oceans, in order to identify both uncertainties and appropriate protective measures to ensure the precautionary development of seabed mining in line with environmental protection obligations. The question is: has the ISA utilised its mandate regarding marine scientific research to further these goals? Certainly, its activities have contributed to the identification of uncertainties and indeed the identification of protective measures, primarily marine protected areas. However, to date, the ISA has only acted upon some of the information generated. The Kaplan project has been instrumental in leading to the establishment of protected areas in the Clarion-Clipperton Zone, discussed below in Section 6.3.1, to reduce the potential harm from nodule mining. In contrast, although recommendations for declaring protected areas were made regarding seamounts and chemosynthetic ecosystems in 2011, these have not yet been considered further. Furthermore, as analysed in Section 6.4 below, the regulation specifically dealing with vulnerable marine ecosystems, such as cold-water corals at seamounts and chemosynthetic ecosystems associated with hydrothermal vents, has not yet been implemented.

The discussion also illustrates that the research projects that have generated new scientific data were not necessarily outcomes of the ISA initiatives in the framework of a strategic research agenda. Instead, the Authority collaborates with external research projects, such as the Kaplan project and the Census of Marine Life. Although collaborations can be beneficial to maximize efficiency and research capacity, the question is whether the ISA fully utilises its mandate to actively set research agendas with respect to the protection of the marine environment from seabed mining. In this context, it must be noted that much research remains to be done, including concerning the cumulative impacts of mining operations and other influences. Pursuant to its mandate, the ISA can commission, or indeed conduct, research into these questions and does not have to wait until an external research institution takes up the challenge. The implementation of this mandate, of course, depends on the availability of financial and institutional resources.⁴¹

(25 July 2013), and ISBA/20/A/9 (24 July 2014) (*Nodules Exploration Regulations*), regulation 36(2); *Regulations on Prospecting and Exploration for Polymetallic Sulphides in the Area*, ISBA/16/A/12/Rev.1 (15 November 2010), amended by ISBA/19/A/12 (25 July 2013) and ISBA/20/A/10 (24 July 2014) (*Sulphides Exploration Regulations*), regulation 38(2); *Regulations on Prospecting and Exploration for Cobalt-rich Ferromanganese Crusts in the Area*, ISBA/18/A/11 (27 July 2012), amended by ISBA/19/A/12 (25 July 2013) (*Crusts Exploration Regulations*), regulation 38(2).

41 Chapter 8.

A further point worth noting is the role that external scientists play not only in providing the ISA with information relevant to establishing protective measures, but also in driving the research agenda, and consequently also in influencing the management agenda, of the ISA. ISA workshops, together with technical studies commissioned by the ISA Secretariat, provide a platform for external scientists and other experts to contribute to the work of the ISA. As the discussion demonstrates, their suggestions can be influential. Such influence may be beneficial as it provides an opportunity to source detailed expertise from the scientific community and ensure best scientific advice, in accordance with precautionary decision-making. This is further explored in relation to the development of the Environmental Management Plan for the Clarion-Clipperton Zone in Section 6.3.1.

In sum, the ISA has actively collaborated in research projects, commissioned technical studies, and organised scientific workshops. The ISA has utilised at least some of the recommendations that have resulted from these efforts to inform the development of management measures to protect the marine environment from harmful effects of seabed mining. In order to contribute to the implementation of the precautionary approach, research findings have to be considered closely in the assessment and management of the risks of seabed mining. The following sections will examine the extent to which the ISA has adopted protective measures and whether these measures adequately reflect and incorporate the findings of these research projects to give effect to the precautionary principle.

6.3 Marine Protected Areas

The previous section demonstrated that recommendations to establish marine protected areas (MPAs) are among the key outcomes of the ISA's engagement in marine scientific research. MPAs are increasingly recognised as a tangible measure contributing to the implementation of a precautionary approach to the protection of marine biodiversity. As discussed in Chapter 5.4.2.1, this momentum is supported by widespread calls for MPAs, including by the UN General Assembly, in order to manage the conservation of the oceans and protect marine biodiversity.⁴² Against this background, establishing protected areas constitutes a best environmental practice,⁴³ which the ISA is required to apply under the Mining Code.⁴⁴

42 UNGA, UN Document A/RES/68/70 (9 December 2013), paragraphs 208–213.

43 ISA, ISBA/17/LTC/7 (13 July 2011), paragraph 21 (EMP-CCZ).

44 *Nodules Exploration Regulations*, regulation 31(2); *Sulphides and Crusts Exploration Regulations*, regulation 33(2).

As discussed in Chapter 5.4.2.2, although the ISA's regulatory framework does not mention MPAs specifically, it does provide for the protection of parts of the Area from seabed mining activities. Moreover, the ISA has a mandate to declare MPAs as a 'necessary measure' to ensure marine environmental protection pursuant to Article 145 LOSC. The Legal and Technical Commission has the corresponding obligation to make recommendations to the Council regarding environmental protection measures and the Council can decide on specific policies including the establishment of MPAs.⁴⁵ So has the ISA utilised its mandate to give effect to the calls for MPAs? The answer, in short, is that it has started to. The Environmental Management Plan for the Clarion-Clipperton Zone was the ISA's a first step in creating MPAs.

6.3.1 *The Environmental Management Plan for the Clarion-Clipperton Zone*

The Environmental Management Plan for the Clarion-Clipperton Zone (EMP-CCZ), adopted in 2012,⁴⁶ is one of the most significant management measures endorsed by the ISA. The Clarion-Clipperton Zone in the eastern central Pacific is approximately six million km² in size, broadly comparable to the size of Europe,⁴⁷ and has a particularly high abundance of polymetallic nodules.⁴⁸ The CCZ has been the focus of scientific research, prospecting, and exploration activities since the 1960s. Over 15 contracts to explore for nodules in this area have been concluded with the ISA. As such, it is an area that could experience significant impacts from several parallel seabed mining operations.

The EMP-CCZ is the first of its kind and can be regarded as an important step in implementing the ISA's environmental mandate. The EMP-CCZ is a document setting out a spatial management plan for the region. It designates nine Areas of Particular Environmental Interest (APEI) that are closed to mining activities⁴⁹ but open to scientific research.⁵⁰ The EMP-CCZ specifies operational objectives for: (a) the entire Clarion-Clipperton Zone; (b) areas assigned to contractors; and (c) the APEIs. The overarching goal of the EMP-CCZ

45 LOSC, articles 162, 165(2)(e).

46 EMP-CCZ (n. 43).

47 Michael Lodge et al., 'Seabed Mining: International Seabed Authority Environmental Management Plan for the Clarion-Clipperton Zone. A Partnership Approach' (2014) 49 *Marine Policy* 66–72, page 72.

48 EMP-CCZ (n. 43), paragraphs 14–17.

49 ISA, ISBA/18/C/22 (26 July 2012), paragraph 6; EMP-CCZ (n. 43), paragraph 39.

50 ISBA/18/C/22 (n. 49), paragraphs 8–9.

is to facilitate seabed mining 'in an environmentally responsible manner'.⁵¹ It reiterates the requirement for contractors to apply best available environmental practices and to collect environmental data in their contractual area. Given that all current exploration contracts in the Clarion-Clipperton Zone focus on nodules, the EMP-CCZ was designed to manage the environmental impact from nodule mining, although the plan does not specifically exclude other mineral deposits.

The EMP-CCZ introduces two novel elements into the ISA's work. First, it provides some indication of a conservation objective, namely to protect marine biodiversity and ecosystem structures and functions in the Clarion-Clipperton Zone.⁵² The plan's vision also highlights the preservation of representative and unique marine habitats and species.⁵³ Although these formulations leave considerable room for interpretation, they are more specific than the objectives of protecting the marine environment against 'harmful effects' of seabed mining and preventing 'interference with the ecological balance of the marine environment' and 'damage to the flora and fauna', as stated in the LOSC.⁵⁴

The second novelty is the designation of APEIS, which spatially restrict mining activities in the Clarion-Clipperton Zone. As such, APEIS are a form of protected area. Despite initial confusion over the ISA's mandate to designate marine protected areas,⁵⁵ the APEIS have been established, as illustrated in Figure 5. In doing so, the ISA has, for the first time, applied its broad powers under Article 145 as well as Articles 165(2)(e) and 162 LOSC in order to restrict mining activities in specific locations for environmental reasons.

In addition to protecting representative habitat, the APEIS are designed to facilitate marine scientific research. The aim is to integrate biological data from the APEIS and contractors' areas into a Geographic Information System (GIS) database for the Clarion-Clipperton Zone, which the ISA Secretariat is developing in order to establish inter alia a repository of biodiversity in the region.⁵⁶ This will enhance knowledge over appropriate ecosystem-based, spatial management options if sufficient data regarding minerals and living resources is

51 EMP-CCZ (n. 43), paragraph 35(a).

52 Ibid., paragraphs 33, 35, 36, 39.

53 Ibid., paragraph 32.

54 LOSC, article 145.

55 Michael W. Lodge, 'Some Legal and Policy Considerations Relating to the Establishment of a Representative Network of Protected Areas in the Clarion-Clipperton Zone' (2011) 26(3) *The International Journal of Marine and Coastal Law* 463–480.

56 ISA, ISBA/19/A/2 (22 May 2013), paragraph 82.

made available.⁵⁷ However, two factors impede this aim.⁵⁸ First, the lack of raw tabular data associated with environmental baseline studies.⁵⁹ Second, although contractors are required to collect and submit environmental baseline data for their contract areas,⁶⁰ they have no obligation to do so for the nine APEIS, where scientific research is merely encouraged.⁶¹ The 2014 review of the EMP-CCZ noted that '[v]ery limited research into the biology of the APEIS has been carried out since the adoption of the EMP [...]'.⁶² To address this shortage of data, which undermines the implementation of the EMP-CCZ, 'efforts of the secretariat [since July 2014] have been directed towards suppliers of data.'⁶³ In sum, the APEIS are a significant protective measure, although formally integrating research efforts would enhance their value.

An analysis of the development and content of the EMP-CCZ evidences the distinctly precautionary nature of this measure, albeit the approach was ultimately minimised by pragmatic realities. Following the recommendation from the Kaplan project⁶⁴ to establish no-mining areas as an option to best manage biodiversity in the Clarion-Clipperton Zone, a workshop was organised in 2007.⁶⁵ The objective of the expert workshop was to design no-mining areas covering seamounts and the abyssal nodule regions in the Pacific, applying ecosystem-based management and the precautionary principle.⁶⁶ This demonstrates that the precautionary principle informed the development of the Environmental Management Plan from its outset. The workshop participants recommended the establishment of a system of nine protected areas, one in each of the biogeographic sub-regions of the Clarion-Clipperton Zone,

57 Ibid.

58 Aline Jaeckel, 'An Environmental Management Strategy for the International Seabed Authority? The Legal Basis' (2015) 30 *The International Journal of Marine and Coastal Law* 93–119, page 105.

59 Chapter 7.2.3.1; ISA, ISBA/21/LTC/9/Rev.1 (3 March 2015), paragraph 7.

60 *Nodules Exploration Regulations*, regulation 32; *Sulphides and Crusts Exploration Regulations*, regulation 34; IA, annex, section 1(7).

61 EMP-CCZ (n. 43), paragraph 43; ISBA/18/C/22 (n. 49), paragraph 8; Seascope Consultants (n. 39), page 15.

62 Seascope Consultants (n. 39), page 18.

63 ISBA/21/LTC/9/Rev.1 (n. 59), paragraph 6.

64 Chapter 6.2.

65 See <http://www.soest.hawaii.edu/oceanography/faculty/csmith/MPA_webpage/MPAindex.html>.

66 *Proceedings of Pew Workshop on Design of Marine Protected Areas for Seamounts and the Abyssal Nodule Province in Pacific High Seas, University of Hawai'i at Mānoa* (23–26 October 2007) <http://www.soest.hawaii.edu/oceanography/faculty/csmith/MPA_webpage/MPAindex.html>, page 9.

FIGURE 5 Map of the exploration areas in the Clarion-Clipperton Zone as well as the nine Areas of Particular Environmental Interest.
ILLUSTRATION COURTESY OF THE INTERNATIONAL SEABED AUTHORITY (JULY 2015).

protecting a total of approximately 25 percent of the Zone.⁶⁷ Each protected area was suggested to be 400 × 400km, which included a core area of 200 × 200km and a 100km buffer on each side.

When discussing the proposal, the Legal and Technical Commission suggested convening another workshop with scientists, contractors, and members of the Commission to further study the proposal.⁶⁸ The outcome of that workshop, held in 2010, was a draft environmental management plan, which foresaw the possibility of APEIS, although some participants expressed doubts over the scientific basis for the APEIS.⁶⁹

The remaining scientific uncertainties, however, did not prevent the plan from being adopted. In 2011, after having worked on the EMP-CCZ for three years, the LTC made a recommendation to the Council to adopt a provisional plan '[t]o give effect to the precautionary approach called for by the regulations.'⁷⁰ Crucially, however, the LTC had adjusted the location of the APEIS to avoid conflict with existing contract areas.⁷¹ This resulted in 'substantial modifications to the spatial location of the science-based recommendations for the proposed [marine protected area] network.'⁷² Thus, the effectiveness of the APEIS was compromised in order to avoid changes to existing exploration contracts. Given that *early* action and effectiveness of a protective measure in reaching the conservation goal are core elements of the precautionary approach, this relocation of the APEIS compromises the contribution of the EMP-CCZ towards implementing precaution.

The LTC's proposal for an EMP-CCZ included a plan for an expert workshop to 'peer-review and critique the existing proposal and any new data and information from the contractors.'⁷³ The Council, although recalling the need to apply the precautionary approach to improve management of risks to vulnerable marine biodiversity,⁷⁴ declined to adopt the EMP. Instead, it requested the LTC to examine further the proposal together with the outcome of the proposed workshop and to present a revised version in the following year.⁷⁵

67 ISA, ISBA/14/LTC/2* (28 March 2008), paragraph 19.

68 ISA, ISBA/15/C/5 (27 May 2009), paragraph 12.

69 Lodge (n. 55), pages 464–465.

70 ISA, ISBA/17/C/13 (13 July 2011), paragraph 28.

71 EMP-CCZ (n. 43), paragraph 26; ISA, ISBA/17/LTC/2 (6 April 2011), paragraphs 17, 22.

72 L.M. Wedding et al., 'Managing Mining of the Deep Seabed' (2015) 349 *Science* 144–145.

73 EMP-CCZ (n. 43), paragraph 42.

74 ISA, ISBA/17/C/19 (21 July 2011), preamble paragraph 4.

75 Ibid., paragraph 3.

The workshop was held in late 2011,⁷⁶ although its outcomes could not be considered by the LTC in a comprehensive manner at its next meeting due to insufficient time.⁷⁷ Critically, in 2012, the LTC:

expressed concern that there may be new urgency in considering the plan given the increasing number of applications being made to the Authority for new licenses in the CCZ. It also noted that the plan, which is based on application of the precautionary approach, includes regular reviews to include new knowledge as and when it is generated, allowing the plan to be a living blueprint addressing best environmental practice as it develops.⁷⁸

The LTC's recommendation was crucial in light of the danger that further parts of the Clarion-Clipperton Zone could be allocated to contractors before protected areas were designated. This could have further jeopardised the effectiveness of the APEIs. Fortunately, the proposal received overwhelming support⁷⁹ and the Council finally adopted the EMP-CCZ in 2012.⁸⁰

The decision by the Council expressly noted that the EMP-CCZ 'gives effect to the precautionary approach.'⁸¹ Indeed, the plan specifically recognises precaution as a guiding principle.⁸² The EMP-CCZ is the only protective measure taken by the ISA that specifically notes its relevance to the precautionary approach. However, the EMP-CCZ was only adopted when numerous areas in the Clarion-Clipperton Zone were already locked up in exploration contracts and as a result the location of the APEIs had to be changed. This is at odds with two core elements of the precautionary approach, namely that it 'draws attention to the time factor, the temporal dimension [...]',⁸³ and requires *effective* protective measures at an *early* stage. Since the geographical location of exploration areas will determine the location of commercial seabed mineral production in the future, spatial management needs to be applied before exploration contracts

76 ISA, ISBA/18/LTC/4 (17 April 2012); ISA, *Environmental Management Needs for Exploration and Exploitation of Deep Sea Minerals* (ISA Technical Study No. 10) (ISA, 2012).

77 ISA, ISBA/18/C/20 (20 July 2012), paragraph 24.

78 Ibid., paragraph 26.

79 ISA, *Seabed Council gets Reports from Legal and Technical Commission; Discusses Environmental Management Plan for CCZ*, Press Release SB/18/9 (23 July 2012).

80 ISBA/18/C/22 (n. 49).

81 Ibid., paragraph 1.

82 EMP-CCZ (n. 43), paragraph 13(b).

83 *Whaling in the Antarctic* (Australia v Japan: New Zealand intervening) (Judgment) (ICJ, 31 March 2014) (Separate Opinion of Judge Cançado Trindade), paragraph 71.

are granted. Thus, while the EMP-CCZ may be considered an example of good practice,⁸⁴ its value in serving as a precautionary measure has been reduced by the fact that the EMP-CCZ was only adopted after numerous exploration contracts had been concluded, thereby affecting the area that could be protected.

The decision by the Council to adopt the EMP-CCZ also stated that for a period of at least five years no application for exploration or exploitation rights should be granted in the APEIs.⁸⁵ Although a significant step, given that the APEIs were not universally supported as noted above, the protected areas were only adopted on a 'provisional basis' and, thus, do not yet ensure long-term protection. Indeed, the EMP-CCZ itself was only adopted initially for a period of three years and is subject to periodic review.⁸⁶ The first review by a consultant, published in May 2014, confirms the ongoing appropriateness of the plan's vision, goals, and strategic aims and recommends retaining the current configuration of APEIs for at least a further five-year period.⁸⁷ In light of this review, the Council has encouraged the ISA Secretariat and Legal and Technical Commission to continue their work on the implementation of the EMP-CCZ 'up to and beyond 2015.'⁸⁸ This demonstrates that while the EMP-CCZ has been celebrated for its scale and its integration of spatial planning focused on the exploration *and* exploitation phase, the Council could only agree to it on a temporary basis. As a group of scientists who contributed to the planning process for the APEIs notes, if the ISA permanently protects the APEIs from mining 'then it will set a major international precedent in marine management in areas beyond national jurisdiction.'⁸⁹

Interestingly, the APEIs were first developed and proposed by a group of external scientists. Moreover, while the Council was reluctant at first, it required an urgent call from the LTC to achieve adoption of the EMP-CCZ. This illustrates not only the important role of the LTC but also the involvement of external stakeholders in the ISA's decision-making. In addition, it exemplifies the importance of marine scientific research in the implementation of precaution.

In sum, the EMP-CCZ is a notable, albeit so far temporary, step for the ISA in giving effect to its environmental obligations. It contributes to the

84 Lodge et al. (n. 47), page 72.

85 ISBA/18/C/22 (n. 49), paragraphs 1, 6.

86 EMP-CCZ (n. 43), paragraph 46.

87 Seascope Consultants (n. 39), page 19.

88 ISA, ISBA/20/C/31 (23 July 2014), paragraph 9.

89 L.M. Wedding et al., 'From Principles to Practice: A Spatial Approach to Systematic Conservation Planning in the Deep Sea' (2013) 280 *Proceedings of the Royal Society of London. Series B. Biological Science* 20131684–20131693, page 20131690.

implementation of the precautionary principle, although its value is limited by the fact that it was not adopted before numerous exploration contracts had been granted.

6.3.2 *Environmental Management Plans for Other Areas?*

The EMP-CCZ examined in the previous section applies only to the Clarion-Clipperton Zone, although exploration contracts have also been granted for the Atlantic and the Indian Ocean.⁹⁰ In July 2013, addressing this discrepancy, delegates in the Assembly and the Council highlighted the desirability of further EMPs.⁹¹ The UN General Assembly has substantiated this call by inviting the ISA ‘to consider developing and approving environmental management plans in other international seabed area zones, in particular where there are currently exploration contracts.’⁹² In response to this call, the Council encouraged the Legal and Technical Commission, in 2014, to consider further environmental management plans (EMPs).⁹³

In light of this call, an environmental management plan for the Mid-Atlantic Ridge has been suggested,⁹⁴ a region in which there has been growing interest in seabed minerals. The ISA has granted two contracts to explore for sulphides along the Mid-Atlantic Ridge south of the Azores and ‘several other States have conducted marine scientific research or have been prospecting for minerals on the Mid-Atlantic Ridge.’⁹⁵ Additionally, one plan of work to explore for crusts in the south Atlantic has been approved by the ISA.⁹⁶

Against this background, a ‘group of scientists has recently taken the initiative to convene an expert workshop to initiate a scientific and technical process to explore the possibility of developing such [an environmental management plan].’⁹⁷ The ISA ‘has been invited to co-sponsor and participate in the workshop.’⁹⁸ Similar to the process that led to the adoption of the EMP-CCZ, this push towards an environmental management plan for the Mid-Atlantic Ridge is being generated by external scientists, not the ISA.⁹⁹

90 See <<https://www.isa.org/jm/contractors/exploration-area>>.

91 ISA, ISBA/19/C/18 (24 July 2013), paragraph 13.

92 UN Doc A/RES/68/70 (n. 42), paragraph 51; UNGA, UN Doc A/RES/69/245 (29 December 2014), paragraph 51.

93 ISA, ISBA/20/C/L.10 (21 July 2014), paragraph 9.

94 ISBA/21/LTC/9/Rev.1 (n. 59), paragraphs 9–11.

95 Ibid., paragraph 9.

96 ISA, ISBA/20/C/30 (21 July 2014).

97 ISBA/21/LTC/9/Rev.1 (n. 59), paragraph 10.

98 Ibid., paragraph 10.

99 See also L.M. Wedding et al., ‘Managing Mining of the Deep Seabed’ (2015) 349 *Science* 144–145.

Participants at the workshop, held in June 2015, agreed on a road map for the development of an environmental management plan for the Atlantic, and the strategic aims and goals of such a plan.¹⁰⁰ Such a plan will have to differ from the existing EMP-CCZ, in that it will have to address the management needs of particularly vulnerable ecosystems associated with polymetallic sulphides and crusts. The early push for an environmental management plan, at a time when only a few areas along the Mid-Atlantic Ridge are subject to exploration contracts, is a positive sign. Nonetheless, it remains to be seen whether the ISA will take up the development of an environmental management plan for the Mid-Atlantic Ridge and do so before further exploration contracts are granted for the area.

6.3.3 *Multi-Purpose Marine Protected Areas*

The Areas of Particular Environmental Interest designated by the Authority are a significant step in giving effect to the ISA's environmental mandate. However, a remaining challenge is to establish multi-purpose marine protected areas, that is areas which protect the environment not only from seabed mining but also from other impacts, such as fishing or waste dumping. While ecosystems in the nine no-mining areas are protected from seabed mining activities, they could nevertheless be adversely impacted by ocean activities outside the scope of competencies of the ISA. This both potentially undermines the objectives of the Areas of Particular Environmental Interest and can affect studies concerning the environmental impact of seabed mining, which rely on comparisons between mineable and protected areas.

This problem is not unique to the seabed mining context, as marine management in areas beyond national jurisdiction is fragmented both spatially and sectorally. In addressing this problem, a significant first step was taken by the North-East Atlantic Fisheries Commission (NEAFC) and the OSPAR Commission for the Protection of the Marine Environment of the North-East Atlantic. Both organisations have declared a number of areas in the North-East Atlantic, which are protected from adverse impacts associated with specific activities within their mandate, including pollution and bottom fishing, and which overlap with the protected areas by the respective other organisation.¹⁰¹ Building on this collaboration, the NEAFC and the OSPAR Commission concluded a *Collective Arrangement Between Competent*

100 For a summary of the workshop outcomes, see <<https://webgate.ec.europa.eu/maritimeforum/en/node/3718>>.

101 OSPAR Commission, *2012 Status Report on the OSPAR Network of Marine Protected Areas* (2013) <http://www.ospar.org/ospar-data/p00618_2012_mpa_status%20report.pdf>.

International Organizations on Cooperation and coordination regarding selected areas in Areas Beyond National Jurisdiction in the North-East Atlantic. This arrangement was entered into by both parties in 2014 and focuses on marine protected areas designated by either party in order to commits them to 'cooperate and seek coordination to ensure that suitable measures for the conservation and management of these areas are implemented [...]'.¹⁰² This collaboration, although non-binding, could broaden the existing cooperation between both organisations to include a general, mutual recognition of marine protected areas adopted by either party with respect to the sectoral activities within their competence.

In July 2014, the ISA Council discussed whether to join this collective arrangement.¹⁰³ No agreement could be reached although the ISA Secretariat was requested to enter into discussions with the NEAFC and the OSPAR Commission.¹⁰⁴ If the ISA joins the arrangement,¹⁰⁵ this could provide an opportunity to ensure that the marine protected areas established by the OSPAR Commission and NEAFC will also be protected from potential harm associated with seabed mining. This could go some way towards developing multi-purpose marine protected areas, albeit only in the North-East Atlantic. If successful, such an arrangement could also be formed with other organisations that have competence over maritime activities. In fact, the International Maritime Organisation (IMO) is currently considering whether to also join the collective arrangement between the NEAFC and the OSPAR Commission.¹⁰⁶

6.3.4 *Preservation Reference Zones*

A further spatial management measure relevant to the ISA's implementation of the precautionary approach, is the establishment of both *preservation reference zones* and *impact reference zones*, as provided for in the *Exploration*

¹⁰² ISA, ISBA/20/C/15 (1 July 2014), enclosure II, paragraph 5; for an overview of the background of the arrangement, see David Johnson, 'Can Competent Authorities Cooperate for the Common Good: Towards a Collective Arrangement in the North-East Atlantic' in Paul Arthur Berkman and Alexander N. Vylegzhanin (eds), *Environmental Security in the Arctic Ocean* (Springer, 2013) 333–343.

¹⁰³ ISBA/20/C/15 (n. 102).

¹⁰⁴ ISA, ISBA/20/C/32 (23 July 2014), paragraph 27; see also ISA, ISBA/21/C/9* (3 June 2015).

¹⁰⁵ Since 2008, the ISA has developed its cooperation with the OSPAR Commission through a Memorandum of Understanding and reciprocal observer status. See ISA, ISBA/18/C/10 (28 June 2012).

¹⁰⁶ ISA, ISBA/21/C/9 (3 June 2015), paragraph 4.

Regulations.¹⁰⁷ The former are pristine areas in which no mining is allowed and which should be similar to the mined areas in terms of environmental characteristics and biota. *Impact reference zones* on the other hand will be mined and should be representative of the environmental characteristics of the Area to allow an assessment of the effects of activities in the Area on the marine environment, including changes in the biodiversity.¹⁰⁸ These zones are foreseen as part of the monitoring programme that contractors have to establish to continuously monitor the effects of their mining activities on the environment. Moreover, the Environmental Management Plan for the Clarion-Clipperton Zone reiterates the need for impact and preservation reference zones and foresees them as part of each contractor's 'site-specific environmental management plans'.¹⁰⁹ However, the parameters of impact and preservation reference zones are yet to be developed. In particular, two questions remain uncertain. First, the time at which these zones will have to be designated is unclear. Under the original *Nodules Exploration Regulations* adopted in 2000, the designation of such zones was only required 'if the Contractor applies for exploitation rights'.¹¹⁰ Thus impacts of exploration work were neglected, which could result in a distortion of the baseline on which the impact of exploitation work would then be assessed. This changed with the *Sulphides and Crusts Exploration Regulations*, which also led to the *Nodules Exploration Regulations* being updated. Thus, both types of reference zones are now foreseen during the exploration phase, although only 'when required by the Council'.¹¹¹ This change was 'justified by the lack of knowledge of the characteristics of the marine environment at potential exploration sites for sulphides and crusts, the considerable uncertainties surrounding potential effects on the marine environment and the need for better monitoring'.¹¹² However, the Council has not yet required such zones to be designated, perhaps because the LTC *Recommendations* regarding environmental impacts only require a monitoring programme for specific exploration activities that have the potential to cause serious environmental harm, such as creating artificial disturbances on the seafloor, which contractors have not yet commenced.¹¹³ Furthermore,

107 *Nodules Exploration Regulations*, regulation 31(6); *Sulphides and Crusts Exploration Regulations*, regulation 33(6).

108 Ibid.; EMP-CCZ (n. 43), paragraph 41(c); ISA, ISBA/19/LTC/8 (1 March 2013), paragraph 26(d) (*EIA Recommendations*).

109 EMP-CCZ (n. 43), paragraph 41.

110 ISA, ISBA/6/A/18 (13 July 2000), regulation 31(7).

111 *Nodules Exploration Regulations*, regulation 31(6); *Sulphides and Crusts Exploration Regulations*, regulation 33(6).

112 ISA, ISBA/12/C/2 (Part II) (24 May 2006), paragraph 26.

113 *EIA Recommendations* (n. 108), paragraph 19.

the Environmental Management Plan for the Clarion-Clipperton Zone only foresees these zones as part of each contractor's site-specific environmental management plan to be submitted with their 'proposed mining plan prior to operations,' that is prior to the exploitation of minerals.¹¹⁴ However, should test mining, an element of exploration work,¹¹⁵ be undertaken without prior identification of these zones, their value could be undermined.

Second, the size and location of preservation reference zones, as well as any potential buffer zone, remains unclear.¹¹⁶ It is suggested that the relatively close proximity to mined areas of *preservation reference zones* could facilitate recolonisation post-mining.¹¹⁷ However, in order not to be impacted by mining, preservation reference zones will need to be both large and located away from any direct or indirect effects of mining operations, including sediment plumes.¹¹⁸ Integrating the zone into a contractor's exploitation area will 'likely not succeed in its objective of ensuring representative and stable biota.'¹¹⁹ Therefore, designating large no-mining zones outside of contracted areas may be a viable alternative,¹²⁰ although this will likely compromise recolonisation efforts following mining operations. In any event, assessments of environmental impacts using these zones could be distorted by activities other than seabed mining. Similarly, it has yet to be discussed whether some of the uses of preservation reference zones could be fulfilled by larger no-mining areas, such as the Areas of Particular Environmental Interest in the Clarion-Clipperton Zone.¹²¹ A workshop to develop specific guidelines for the establishment of both impact and preservation reference zones is envisaged in the Environmental Management Plan for the Clarion-Clipperton Zone¹²² but has not yet been held.

The review of the Environmental Management Plan for the Clarion-Clipperton Zone also suggests that instead of individual contractors deciding on the location of *preservation reference zones*, their location could be based on strategic environmental assessments,¹²³ whereby environmental baselines data from contractors could be integrated into a regional dataset to identify optimal locations for the zones. This could ensure that any decision regarding the

¹¹⁴ EMP-CCZ (n. 43), paragraphs 18, 41(a).

¹¹⁵ *Exploration Regulations*, regulation 1(3)(b).

¹¹⁶ Seascope Consultants (n. 39), page 11.

¹¹⁷ Ibid.

¹¹⁸ *EIA Recommendations* (n. 108), paragraph 26(d).

¹¹⁹ Lodge (n. 55), pages 466–467.

¹²⁰ Seascope Consultants (n. 39), page 11–12. For a summary of the discussion on the various zonal options, see Lodge (n. 55), pages 466–467.

¹²¹ Seascope Consultants (n. 39), page 15.

¹²² EMP-CCZ (n. 43), paragraph 50.

¹²³ Chapter 5.4.1.2.

location of preservation reference zones would take into account regional spatial planning to ensure preservation reference zones are located a reasonable distance away from any mining operations in an adjacent contract area.¹²⁴

In sum, although incorporated into the Mining Code, impact and preservation reference zones have not yet been translated into practice. Thus, reference zones and environmental management plans for individual contract areas, as foreseen by the Environmental Management Plan for the Clarion-Clipperton Zone, present *potential* precautionary measures. Because reference zones facilitate environmental impact assessments (EIAs) and essentially represent no-mining areas, albeit very small ones, they could become an important element in the ISA's implementation of the precautionary principle.

6.3.5 Safety Margins

A protective measure relevant to the implementation of the precautionary principle and often directly associated marine protected areas is a safety margin; an ecological buffer to minimise environmental harm in the absence of scientific certainty.¹²⁵ The ISA has utilised precautionary safety margins in the form of physical protection zones in establishing the nine Areas of Particular Environmental Interest in the Clarion-Clipperton Zone.¹²⁶ The core of each APEI is surrounded by 100km buffer zones in each direction to ensure mining operations in adjacent areas will not impact the biodiversity and ecosystem functions within the APEIs.¹²⁷ This size is estimated to protect the APEIs from the limits of dispersal of plumes, although lack of research required the size to be determined as a 'best guess'.¹²⁸

In addition to being spatial management tools, safety margins can also take the form of quotas, for example cautious catch limits as applied in the fisheries context.¹²⁹ The margin of error can be expanded with increased uncertainties. In the seabed mining context, this could be used to set quantitative limits for

124 Seascope Consultants (n. 39), page 11.

125 Trouwborst (n. 5), pages 169–170; Rosie Cooney, *The Precautionary Principle in Biodiversity Conservation and Natural Resource Management: An Issue Paper for Policy-Makers, Researchers and Practitioners* (IUCN, 2004), page 30.

126 Chapter 6.3.1.

127 EMP-CCZ (n. 43), paragraph 25.

128 Lodge et al. (n. 47), page 71; see also Wedding et al. (n. 89), page 20131687.

129 *Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks* (adopted 4 August 1995, entered into force 11 Dec 2001) 2167 UNTS 3, article 6, annex II; *FAO Code of Conduct for Responsible Fisheries* (adopted 31 October 1995), article 7(5).

exploration and exploitation activities in a particular region, in light of the environmental harm suspected from cumulative impacts. It remains to be seen whether such measures will be adopted for the exploitation phase.

This section has examined the ISA's implementation of marine protected areas. Instead of repeating the conclusions drawn in each of the sections, some macro-level observations might be useful. Although it is significant that the ISA has started to utilise spatial planning and APEIs, it only designated the first APEIs in 2012, 11 years after the first six exploration contracts were granted for the Clarion-Clipperton Zone. This is perhaps even more noteworthy, when it is realised that the APEIs are not the product of strategic environmental assessments by the ISA but rather of the recommendations of scientists engaged in research on the deep ocean environment. Nevertheless, while the lack of strategic environmental assessments by the ISA *before* exploration contracts are given out can be criticised, the involvement of external scientists is a positive characteristic of the ISA's decision-making. Given the uncertainties involved in seabed mining, any risk assessment and risk management decision must be based on best available science. In line with this aim, the example of regional EMPs illustrates the ISA's active collaboration with the scientific community.

6.4 Measures Pertaining to Particularly Vulnerable Ecosystems

A further precautionary measure, aimed at particularly vulnerable ecosystems, is provided for in the *Exploration Regulations*. The *Regulations* recognise that vulnerable marine ecosystems, such as hydrothermal vents, seamounts, and cold-water corals, may require special management.¹³⁰ The Legal and Technical Commission is required to develop and implement procedures for determining whether proposed *exploration* activities in the Area would have serious harmful effects on vulnerable marine ecosystems. If this is the case, the LTC must ensure 'those activities are managed to prevent such effects or not authorized to proceed.'¹³¹

Although this obligation could lead to marine protected areas around vulnerable ecosystems, as discussed in Chapter 5.4.2.2, it extends further than that. The formulation of the provision is non-restrictive and could allow the

130 *Sulphides and Crusts Exploration Regulations*, regulation 33(3). The *Nodules Exploration Regulations* have been updated in 2013 to integrate this and other provisions, see *Nodules Exploration Regulations*, regulation 31(4).

131 *Nodules Exploration Regulations*, regulation 31(4); *Sulphides and Crusts Exploration Regulations*, regulation 33(4).

LTC to decide to prohibit mining, and indeed exploration work, around vulnerable marine ecosystems. Because it enables action at an early stage, during mineral exploration, this provision has significant potential to support the ISA's implementation of the precautionary approach. The importance of this provision is illustrated in the summary of the LTC's work on the *Sulphides and Crusts Exploration Regulations*:

[T]he Commission recalls the way in which polymetallic sulphide and cobalt-rich ferromanganese crusts occur in parts of the marine environment that are now known to host complex—and, in many ways, unique—marine ecosystems, and of a type that may be susceptible to major trauma. There is *some potential for serious and permanent harm* in these areas during the process of seabed mining. While this may also be, to some extent, the case for nodule mining (we are still not absolutely sure of this), the nodule deposit is one that, by its nature, covers so wide an area that the extent of such harm may be mitigated. For sulphides occurring at active sites, the deposits are very localized, hence the *potential impact at a mine site is likely to be significant*. For these reasons, there has been much more emphasis on the protection and preservation of the marine environment in the draft regulations on prospecting and exploration for polymetallic sulphides and cobalt-rich ferromanganese crusts in the Area.¹³²

However, despite this importance and the fact that this obligation was incorporated into the Mining Code in 2010, the Legal and Technical Commission has not yet acted upon it. What is more, the UN General Assembly has repeatedly called upon the ISA and other international organisations to 'urgently consider' means to manage the risks to these vulnerable ecosystems.¹³³ However, no action has been taken under these provisions. In the meantime, the ISA has already granted exploration contracts for polymetallic sulphides, associated with hydrothermal vents, to China, Russia, Korea, France, India, Germany and exploration contracts for ferromanganese crusts on seamounts to Japan, China, Russia, Brazil, and Korea without having considered whether special protective measures are necessary.¹³⁴ Moreover, the ISA has granted over 15 exploration contracts to explore for nodules.¹³⁵ Some of these exploration areas include vulnerable ecosystems that could be impacted by nearby nodules exploration

¹³² ISA, ISBA/11/C/5 (12 August 2005), paragraph 15.

¹³³ UNGA, UN Doc A/Res/67/78 (11 December 2012), paragraphs 190–191; UN Doc A/RES/68/70 (n. 42), paragraphs 206–207; UN Doc A/RES/69/245 (n. 92), paragraphs 221–222.

¹³⁴ See <<https://www.isa.org/jm/deep-seabed-minerals-contractors>>.

¹³⁵ Ibid.

work.¹³⁶ These developments are particularly alarming since the experience in the Clarion-Clipperton Zone demonstrated that for marine protected areas to be most effectively located, they need to be agreed before dividing marine spaces into various contract areas. This failure to act and to give effect to an important provision in the Mining Code significantly undermines the ISA's implementation of the precautionary approach.

As indicated at the outset of this section, the protection of vulnerable marine ecosystems could extend beyond the creation of particular marine protected areas and could ultimately lead to a restriction or prohibition of exploration activities near particularly vulnerable ecosystems. In other words, instead of permitting seabed mining everywhere except for in marine protected areas, mining could generally be restricted within a certain radius of vulnerable ecosystems. A parallel may be drawn with deep sea fisheries, which are to be restricted around these ecosystems.¹³⁷ A general restriction of seabed mining near vulnerable ecosystems would address some of the scientific uncertainties regarding the effects of mining. With respect to cobalt-rich crusts, for example, the Legal and Technical Commission noted that biological communities differ at various locations on the seamount depending on the substrate available as well as the location of the oxygen minimum zone. 'There is also a great deal of variation between seamounts that makes it difficult to predict impacts on one seamount from research on another.'¹³⁸ This in turn impedes any determination as to whether local effects from mining activities could have global effects, 'such as the extinction of endemic species.'¹³⁹ Against this background, individual marine protected areas might not be able to fully protect vulnerable ecosystems associated with seamounts. Certainly, if future exploitation regulations limit or prohibit commercial mining in areas around particularly vulnerable ecosystems, it would be coherent to apply similar restrictions for exploration activities, not least to avoid contractors spending unnecessary time and funds exploring for minerals in those 'exclusion zones.'

Prohibiting a potentially harmful activity is one of the most far-reaching precautionary measures. While a general moratorium raises questions of

¹³⁶ EMP-CCZ (n. 43), paragraph 15.

¹³⁷ FAO, *International Guidelines for the Management of Deep-Sea Fisheries in the High Seas* (FAO, 2009).

¹³⁸ ISA, ISBA/10/C/4 (28 May 2004), paragraph 15.

¹³⁹ Gwénaëlle Le Gurun, 'Environmental Impact Assessment and the International Seabed Authority' in Timo Koivurova and C.J. Bastmeijer (eds), *Theory and Practice of Transboundary Environmental Impact Assessment* (Brill Academic Publishers, 2007) 221–264, page 239.

proportionality¹⁴⁰ the international community has recognised moratorium as a viable, albeit exceptional, measure for the protection of particularly vulnerable species and ecosystems. For example, moratoria have been applied to large-scale pelagic drift-net fishing on the high seas,¹⁴¹ and commercial whaling.¹⁴² In the specific case of seabed mining, the now defunct 1988 *Convention on the Regulation of Antarctic Mineral Resource Activities* (CRAMRA) provided for the prohibition of seabed mineral mining in the Antarctic in 'any area designated as a Specially Protected Area or a Site of Special Scientific Interest under Article IX(1) of the Antarctic Treaty'¹⁴³ and specifically allowed prohibitions based on ecological and environmental reasons.¹⁴⁴ Before entering into force, however, CRAMRA was replaced by the 1991 *Protocol on Environmental Protection to the 1959 Antarctic Treaty*, which established a moratorium on *all* mineral resource activities in the Antarctic.¹⁴⁵

The integration into the Mining Code of an obligation for the LTC to consider special protection measures for vulnerable marine ecosystems during the exploration phase was an important step in line with the precautionary approach and the ISA's environmental mandate. However, the ISA has failed to act upon that obligation. The LTC has not yet performed the required assessment as to whether exploration work would have serious harmful effects on these ecosystems, let alone adopted management measures. Instead, the number of exploration contracts being granted is rapidly increasing. This begs the question: how can restrictive environmental standards be imposed once 15-year exploration contracts have been concluded?¹⁴⁶ This failure to act early jeopardises the effectiveness of any further management measures and significantly undermines the ISA's implementation of the precautionary approach.

¹⁴⁰ Chapter 2.3.3.

¹⁴¹ UNGA, UN Doc A/RES/46/215 (20 December 1991).

¹⁴² *Convention on the Conservation of Antarctic Marine Living Resources* (adopted 20 May 1980, entered into force on 7 April 1982) 1329 UNTS 48, schedule as amended by the Commission at the 65th meeting (September 2014), paragraph 10(e).

¹⁴³ *Convention on the Regulation of Antarctic Mineral Resource Activities* (opened for signature 2 June 1988, not in force) 27 ILM (1988), article 13(1).

¹⁴⁴ *Ibid.*, article 13(2).

¹⁴⁵ *Protocol on Environmental Protection to the Antarctic Treaty* (adopted 4 October 1991, entered into force on 14 January 1998) 30 ILM 1455 (1991), article 7.

¹⁴⁶ See Chapter 7.3.

6.5 Listing of Particular Activities

A further precautionary measure is the listing of activities or substances that are presumed either to cause or not cause serious environmental damage. This measure allows grouping of activities to apply particular conditions to such groups. It can be applied in a variety of ways. For example, a list can indicate all activities presumed to *not* cause serious environmental harm, which may then be carried out with few or no restrictions. Other activities can be either prohibited or subject to restrictions. The *OSPAR Convention*, for instance, applies listing in relation to pollution by dumping or incineration whereby '[t]he dumping of all wastes or other matter is prohibited, except for those wastes or other matter listed in paragraphs 2 and 3 of this Article.'¹⁴⁷ Similar measures can be applied to processes or indeed to biodiversity, by declaring all species as protected unless they are specifically listed as non-endangered.¹⁴⁸

Conversely, lists can name all activities that are presumed to be harmful, which are then either subject to stricter requirements or prohibited unless they can be shown not to cause serious environmental damage. This in effect incorporates a reversal of the burden of proof and is, thus, also a procedural measure. The *Convention on Persistent Organic Pollutants*, for example, prohibits and restricts the use and production of listed chemicals.¹⁴⁹

The ISA uses listing albeit in a limited manner, for example in the *Recommendations for the guidance of contractors for the assessment of the possible environmental impacts arising from exploration for marine minerals in the Area (EIA Recommendations)*. The *Recommendations* specifically list those exploration activities requiring prior EIAs as well as environmental monitoring during and after the activity.¹⁵⁰ Additionally, the *Recommendations* specify those activities considered to have no potential for causing serious environmental harm and which are consequently not subject to EIAs.¹⁵¹ Although the use of these lists does not result in a reversal of the burden of proof, it provides recommendations to the contractors and indeed the sponsoring states as to

147 *Convention for the Protection of the Marine Environment of the North-East Atlantic*, (adopted 22 September 1992, entered into force 25 March 1998) 2354 UNTS 67, annex II article 3(1).

148 But see the discussion about potential negative side effects of directly linking the biological status of species with specific management responses in Cooney (n. 125), pages 34–35.

149 *Convention on Persistent Organic Pollutants* (adopted 22 May 2001, entered into force 17 May 2004) 2256 UNTS 119, article 3(1).

150 *EIA Recommendations* (n. 108), paragraphs 19–25.

151 *Ibid.*, paragraph 18.

how to implement their legal obligations with respect to EIAs and the environmental monitoring programme.

Listing could be used in additional ways in the seabed mining context. For example, listing could be deployed to permit only specific mining activities compiled in lists or to register rare or particularly important species in order to afford specific protective measures to them. For the latter, a better knowledge of deep sea species and ecosystems will likely be a prerequisite, not least, as discussed in Chapter 2.3.3, to ensure the measure will be both effective and proportionate. Nonetheless, in line with the precautionary principle, it is not necessary to overcome all uncertainty.

6.6 Emergency Orders

Emergency orders are an important measure to prevent and limit environmental harm in the case of urgent incidents. As discussed in Chapter 5.4.4, emergency measures are foreseen in the LOSC¹⁵² and the *Exploration Regulations* add a response mechanism that enables the ISA to intervene in case activities by a contractor 'have caused, are causing or pose a threat of serious harm to the marine environment.'¹⁵³ In these situations, the Council, upon recommendation by the Legal and Technical Commission, may order suspension or adjustment of operations. Moreover, the ISA Secretary-General has the competence to take immediate measures of a temporary nature, for no longer than 90 days. If the contractor does not comply, the Council is authorised to take 'such practical measures as are necessary to prevent, contain and minimize any such serious harm or threat of serious harm to the marine environment.'¹⁵⁴

However, it remains entirely unclear how to give effect to emergency orders and which practical measures such orders could entail. In particular, it is unclear how the Council and the LTC can decide over measures in an emergency, when both bodies only meet one to two times a year. Moreover, it is unclear which practical measures such orders could entail. A brief examination of the history of the *Exploration Regulations* illustrates this difficulty. In adopting the first set of *Exploration Regulations* in 2000, the Council noted its concern regarding 'the need for appropriate forms of guarantee to enable the Council to take immediately the necessary measures to implement an

¹⁵² LOSC, articles 162(2)(w), 165(2)(k).

¹⁵³ *Nodules Exploration Regulations*, regulation 33; *Sulphides and Crusts Exploration Regulations*, regulation 35.

¹⁵⁴ *Nodules Exploration Regulations*, regulation 33(7); *Sulphides and Crusts Exploration Regulations*, regulation 35(7).

emergency order in the event of failure or inability on the part of a contractor to comply with such orders.¹⁵⁵ Such guarantees include availability of financial resources as well as contingency plans and emergency response strategies. While the Council noted this deficiency and appreciated that significant risks for the marine environment would arise at the phase of testing of collecting systems and processing operations,¹⁵⁶ it chose to postpone consideration of the matter. Nevertheless, it did decide to consider guarantees for emergency orders by contractors prior to any test mining.¹⁵⁷ To that end, the Council requested the Secretariat, in 2000, to carry out comparative studies of appropriate options to inform its future discussions on the matter.¹⁵⁸ However, as of July 2016, no studies or discussions have been published. This is important because emergency orders are not limited to the exploitation phase. Test mining and other activities that the LTC has recognised as having the potential to cause serious environmental harm¹⁵⁹ can be carried out under an exploration contract. In short, although provided for in the Mining Code, the ISA has, at present, failed to fully provide for the implementation of emergency orders.

In conclusion, in line with the precautionary approach, the *Exploration Regulations* elaborate on emergency orders as foreseen in the LOSC by determining the roles of the Secretary-General, the Council, the LTC, and contractors in identifying and responding to an emergency.¹⁶⁰ However, the *Regulations* currently fall short of specifying the details of such orders and they fail to require guarantees to give effect to emergency orders. Moreover, the ISA has not yet ensured the institutional capacity necessary to fully implement emergency orders. As such, while emergency orders are a protective precautionary measure, their implementation remains compromised.

6.7 Environmental Restoration

Restoring habitat and facilitating resettlement of biota in mined areas constitutes a further potential measure within the spectrum of environmental protection tools. While not a precautionary measure as such, owing to its focus on remediation rather than prevention, an early consideration of restoration possibilities can influence the assessment of the risks associated with seabed

¹⁵⁵ ISA, ISBA/6/C/12 (13 July 2000), part II preamble paragraph 3.

¹⁵⁶ *Ibid.*, part II, preamble paragraph 1.

¹⁵⁷ *Ibid.*, part II, paragraph 1.

¹⁵⁸ *Ibid.*, part II, paragraph 2.

¹⁵⁹ *EIA Recommendations* (n. 108), paragraph 19.

¹⁶⁰ See Chapter 5.4.4.

mining. In other words, knowing about the feasibility of restoration affects the degree of caution to be exercised at an early stage.

Restoration potential will likely differ for the three types of mineral deposits. Polymetallic nodules require millennia to grow and build the hard substrata for diverse biota. Once removed, it is difficult to restore ecosystems associated with this substratum.¹⁶¹ As Van Dover et al. observe, 'How do we begin to contemplate restoration of nodule beds, bearing in mind factors such as these? In such a case, restoration simply may not be the optimal goal or tool for environmental management.'¹⁶² The same is likely true for cobalt-rich crusts, not least because cold-water corals on seamounts are exceptionally long lived and stable ecosystems.¹⁶³ As representatives of the EU funded MIDAS research project, short for *Managing Impacts of Deep-sea Resource exploitation*,¹⁶⁴ noted:

For nodule and crust areas the species are likely to be long lived and slow growing with a low potential to recolonise. [...] The removal of the nodules and crusts will effectively take away that habitat and this cannot be restored as the resource takes millions of years to form under particular conditions. One must be very careful to suggest restoration and rehabilitation with these habitats.¹⁶⁵

Polymetallic sulphides are associated with hydrothermal vent ecosystems, which are dynamic ecosystems that undergo natural catastrophic disturbances through tectonic or volcanic activity.¹⁶⁶ They are more likely to recover than ecosystems associated with nodules or crusts. However, high degrees of endemism around hydrothermal vents exacerbate the challenges of resettling biota following mining operations.¹⁶⁷ Moreover, an identification of those

¹⁶¹ C.L. Van Dover et al., 'Ecological Restoration in the Deep Sea: Desiderata' (2014) 44 *Marine Policy* 98–106, page 103.

¹⁶² Ibid.

¹⁶³ J. Murray Roberts, Andrew J. Wheeler, and André Freiwald, 'Reefs of the Deep: The Biology and Geology of Cold-Water Coral Ecosystems' (2006) 312 *Science* 543–547.

¹⁶⁴ MIDAS is a multidisciplinary project, set up in 2013, to investigate the environmental impacts of extracting mineral and energy resources from the deep seabed. See <<http://www.eu-midas.net>>.

¹⁶⁵ Submission to the Stakeholder Survey (n. 6) by MIDAS, page 4.

¹⁶⁶ Van Dover et al. (n. 161), page 102; Maria C. Baker et al., 'Biogeography, Ecology, and Vulnerability of Chemosynthetic Ecosystems in the Deep Sea' in Alasdair McIntyre (ed), *Life in the World's Oceans: Diversity, Distribution, and Abundance* (Wiley-Blackwell, 2010) 161–182.

¹⁶⁷ Baker et al. (n. 166), page 164.

ecosystem functions that are critical to restore is not yet possible owing to a lack of knowledge over ecosystem functions in the deep ocean.¹⁶⁸ In general, the outcome of even well-planned environmental restoration is uncertain.¹⁶⁹

In addition to these challenges, costs for restoration efforts in the deep sea 'will be high (likely orders of magnitude higher) relative to those on land or in shallow water due to the remote and technically challenging aspects of deep-sea manipulations.'¹⁷⁰ Consequently, restoration of deep ocean ecosystems will likely be nearly impossible for some ecosystems and will require high, potentially prohibitive expense in any case.¹⁷¹

Against this background, strong precautionary measures are required. The environmental harm of removing mineral deposits that provide habitat for deep ocean ecosystems will in some cases be irreversible in human timescales.¹⁷² As discussed in Chapter 2.3, any long-term, or indeed irreversible, effects influence the evaluation of the proportionality and effectiveness of a precautionary measure.¹⁷³ This underlines the importance of taking early and strong precautionary measures, such as declaring marine protected areas and putting in place measures to protect vulnerable marine ecosystems as examined in Chapters 6.3 and 6.4 respectively.

The importance of concentrating on precautionary measures as opposed to restoration has been appreciated by the ISA, as a brief summary of its considerations of restorative options demonstrates. Neither the LOSC nor the *Exploration Regulations* specifically mention requirements with respect to environmental restoration. However, the Environmental Management Plan for the Clarion-Clipperton Zone requires contractors to 'develop plans to ensure responsible environmental management to enhance the recovery of habitats and faunal communities.'¹⁷⁴ In developing the regulatory framework for

168 Submission to the Stakeholder Survey (n. 6) by Professor Hjalmar Thiel and Dr Gerd Schriever, page 4; by DOSI, pages 12–13.

169 Katharine N. Suding, 'Toward an Era of Restoration in Ecology: Successes, Failures, and Opportunities Ahead' (2011) 42 *Annual Review of Ecology, Evolution, and Systematics* 465–487.

170 Van Dover et al. (n. 161), page 100.

171 Ibid.; Kathryn J. Mengerink et al., 'A Call for Deep-Ocean Stewardship' (2014) 344 *Science* 696–698, page 697.

172 Hjalmar Thiel, 'Evaluation of the Environmental Consequences of Polymetallic Nodule Mining Based on the Results of the TUSCH Research Association' (2001) 48 *Deep Sea Research II* 3433–3452, page 3443.

173 Commission of the European Communities, *Communication from the Commission on the precautionary principle*, COM(2000) 1 final (2 February 2000), pages 17–18.

174 EMP-CCZ (n. 43), paragraph 38(d); see also paragraph 41(f).

exploitation, the ISA had started to consider restoration options more broadly. The draft framework for exploitation published in July 2015, foresees a regulation to require contractors to undertake restoration where feasible and references 'technical feasibility' and 'cost-efficiency' in this respect.¹⁷⁵ Yet it also notes there is '[g]eneral consensus by stakeholders for focus to be on impact minimisation and mitigation measures rather than restoration at this time.'¹⁷⁶

What is important for the purpose of this study is that while restoration will likely form part of the legal framework for the exploitation of seabed minerals, its efficacy remains unknown. As such, the focus must be on adopting strong precautionary measures to minimise harm before widespread and partly irreversible damage occurs as well as conducting marine scientific research to support the development of effective protective measures.¹⁷⁷

6.8 Conclusion

This chapter has clearly demonstrated that what is incorporated into the ISA's *Regulations* and *Recommendations* is not necessarily what is implemented in practice. There are at least two positive examples of actions not mentioned in the Mining Code, yet implemented in practice. First, the Environmental Management Plan for the Clarion-Clipperton Zone, with its establishment of nine protected areas, is perhaps the single most important environmental protection measure the ISA has adopted. It was adopted despite neither environmental management plans nor marine protected areas being specifically mentioned in the Mining Code or the LOSC. The Plan was specifically adopted to give effect to the precautionary approach, although its value in doing so is limited by the fact that it was not adopted before numerous exploration contracts had been granted. Consequently, the location of the protected areas was changed because some of the seafloor that should have been protected was already locked up in exploration contracts.

The second positive example is the involvement of the ISA in marine scientific research. As concluded in Chapter 5.5, while the Mining Code specifies research obligations for contractors, it does not specifically develop the ISA's mandate to promote, encourage, and conduct marine scientific research

175 ISA, *Developing a Regulatory Framework for Deep Sea Mineral Exploitation in the Area: Draft Framework, High Level Issues and Action Plan, Version II*, (15 July 2015) <https://www.isa.org.jm/files/documents/EN/OffDocs/Rev_RegFramework_ActionPlan_14072015.pdf>, page 35.

176 Ibid.

177 Mengerink et al. (n. 171), page 698; Van Dover et al. (n. 161), page 102.

concerning the Area.¹⁷⁸ Nevertheless, in practice the ISA has engaged in several research projects. It is noteworthy though that much of the research that generated new scientific data was not necessarily conducted on the ISA's initiative but was instead conducted by external research institutions with whom the ISA then collaborated. Pursuant to the precautionary principle, scientific research must be an important element in the adoption of particular protective measures. This was indeed the case for the nine Areas of Particular Environmental Interest in the Clarion-Clipperton Zone which were recommended by external scientists following the Kaplan research project. However, the same cannot be said with respect to the recommendations from scientists to utilise spatial management tools for the protection of seamount ecology and chemosynthetic ecosystems around sulphide-rich hydrothermal vents. These recommendations have yet to be taken up.

In contrast to these two largely positive examples, some important protective measures foreseen in the Mining Code have not yet been implemented. Most importantly, the Legal and Technical Commission has not yet deliberated over the impacts that mineral exploration work can have on particularly vulnerable ecosystems, such as cold-water corals and hydrothermal vent communities. The Mining Code allows for far-reaching measures to be adopted, including the possibility that these activities are 'not authorized to proceed' if they are found to be seriously harmful.¹⁷⁹ Instead of acting upon these provisions, the ISA has continued to grant exploration contracts in areas around vulnerable ecosystems without assessing the potential impacts. This is particularly alarming because the discussion regarding restoration measures demonstrate that post-mining restoration is impossible in some cases and certainly very costly in any case. Consequently, it is all the more important to minimise harm before widespread and partly irreversible damage occurs. The ISA's failure to act with respect to vulnerable marine ecosystems, despite repeated calls by scientists, significantly undermines the ISA's implementation of the precautionary approach.

Similarly, the ISA has not yet given effect to preservation reference zones or utilised safety margins in the form of quotas. The latter could allow the ISA to address the cumulative risks of numerous parallel exploration and exploitation activities. However, despite the Environmental Management Plan for the Clarion-Clipperton Zone recognising the importance of addressing such risks, no action has yet been taken. Lastly, the ISA is at present unprepared to deal with environmental emergencies. Although the Mining Code develops a basic procedure, it is unclear how emergency orders would be implemented.

¹⁷⁸ LOSC, article 143.

¹⁷⁹ *Nodules Exploration Regulations*, regulation 31(4); *Sulphides and Crusts Exploration Regulations*, regulation 33(4).

It is of course true that seabed mining is currently only in the exploration phase and that the implementation of these measures will be most important during the forthcoming exploitation stage. However, the analysis of the ISA's current implementation of protective measures is nonetheless important for two reasons. First, environmental harm can already be caused during exploration work, which includes test mining, drilling, and creating artificial disturbances on the seafloor.¹⁸⁰ Second, an analysis of the strengths and weaknesses of the ISA's work during the exploration stage helps to identify critical issues relevant to the development of the regulatory and institutional framework for the exploitation stage.

To add some high level concluding remarks to this chapter, the discussion has demonstrated the challenge for the ISA in applying protective measures at an *early* stage, which in turn compromises its implementation of the precautionary approach. In particular, the need to act in a timely manner is problematic with respect to the designation of impact and preservation reference zones, the protection of particularly vulnerable ecosystems, and the setting of Areas of Particular Environmental Interest in the Clarion-Clipperton Zone.

A further conclusion that can be drawn is that there is a lack of a strategic vision for balancing seabed mining and environmental protection. The protective measures were adopted through ad hoc decisions. To counteract this, the adoption of a comprehensive environmental management strategy would not only be in line with the ISA's mandate but it would ensure that protective measures could be integrated into a broader vision and that each measure would supplement or complement the others.¹⁸¹ This could also facilitate measures being taken at an early stage in line with the requirement of timing under the precautionary principle.

Building on this lack of strategic vision, a last point that must be highlighted is the role of third parties. The discussion on marine scientific research demonstrates that much of the research is driven by external scientists. This raises the question: to what extent can the adoption of a protective measure be attributed to the ISA? The ISA is, of course, the decision-making body and the involvement of the scientific community must be warmly welcomed. However, one may wonder whether the EMPs, both for the Clarion-Clipperton Zone and for the Mid-Atlantic Ridge, would have made it onto the ISA's agenda if it were not for the work of external scientists. While the involvement of scientists in the decision-making process is in line with the precautionary principle, a *reliance* on external scientists taking initiatives to research and propose protective measures supposes a secondary role for the ISA that can be problematic.

¹⁸⁰ *EIA Recommendations* (n. 108), paragraph 19.

¹⁸¹ Jaeckel (n. 58).

However, positing the need for a clear and comprehensive environmental strategy for the ISA, presupposes that strategic environmental assessments will identify potential protective measures and compare them at an early stage. This raises the question of whether the ISA's procedural framework, including the ISA's procedural competence to conduct environmental assessments, can provide some explanations as to why some protective measures have been taken and others have not. The following chapter turns to the analysis of this question.