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Analysis of the draft regulations on prospecting and exploration for polymetallic sulphides and cobalt-rich ferromanganese crusts in the Area

Part II: Provisions relating to the protection of the marine environment

Prepared by the secretariat

I. Introduction

1. During the eleventh session of the International Seabed Authority in 2005, the Council completed a first reading of the draft regulations on prospecting and exploration for polymetallic sulphides and cobalt-rich ferromanganese crusts in the Area (hereinafter "the draft regulations"). At the conclusion of that first reading, the Council considered that further explanation and elaboration was required with respect to certain aspects of the draft regulations (ISBA/11/C/11, para. 14). In particular, it requested the Secretary-General to provide the Council with more detailed analysis and elaboration of the following aspects of the draft regulations:

(a) With respect to prospecting, the Council requested further clarification of the relationship between prospecting and exploration and the justifications for the specific changes proposed by the Commission;

(b) With respect to the size of areas for exploration, the Council requested that further information be provided on the proposed system of allocating exploration blocks and the way in which it might operate in practice, as well as on the proposed schedule for relinquishment and its consistency with the provisions of the Convention;

(c) With respect to draft regulations 16 and 19, relating to the proposed system for participation by the Authority, the Council requested a more detailed analysis of how the draft provisions might operate in practice in the light of the comments and opinions expressed in the Council.

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2. The above issues have been covered in part III of the present study and in ISBA/12/C/3. The present part of the study (part II) responds to a further request by the Council for a more detailed analysis of the proposed changes to the draft regulations relating to protection of the environment and their relationship to the provisions of the United Nations Convention on the Law of the Sea and the 1994 Agreement relating to the Implementation of Part XI of the Convention (General Assembly resolution 48/263, annex). Particular concern was raised over the proposed changes to the language in draft regulations 33, 34, 35 and 36.

II. Overview of provisions relating to the protection of the marine environment in the Convention, the 1994 Agreement and the regulations for prospecting and exploration for polymetallic nodules in the Area

3. The general and specific obligations of States to protect and preserve the marine environment are set out in part XII of the Convention. Article 192 establishes a general obligation on all States to "protect and preserve the marine environment". A number of other provisions contained in part XII also have a bearing on activities in the Area. For example, States are required to control and reduce pollution of the marine environment from various sources (for example, ships, seabed installations or land-based sources) by applying or taking into account the norms contained in the network of existing global and regional treaties that have been developed to regulate marine pollution. Article 194, paragraph 5, requires States to take the measures necessary "to protect and preserve rare or fragile ecosystems as well as the habitat of depleted, threatened or endangered species and other forms of marine life". With respect to the Area, article 209, paragraph 1, requires that:

> "international rules, regulations and procedures shall be established in accordance with Part XI to prevent, reduce and control pollution of the marine environment from activities in the Area".

4. The general obligation above is given more specificity in article 145 of part XI, which requires that:

> "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".

To that end, article 145 requires that the Authority adopt rules, regulations and procedures for, inter alia:

> "(a) the prevention, reduction and control of pollution and other hazards to the marine environment, including the coastline, and of interference with the ecological balance of 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;

(b) the protection and conservation of the natural resources of the Area and the prevention of damage to the flora and fauna of the marine environment."

A further enabling provision appears in annex III to the Convention. Article 17, paragraph (1) (b) (xii), permits the Authority to adopt rules, regulations and procedures on mining standards and practices, including those relating to the protection of the marine environment.

5. Since the Convention was adopted, the protection of the marine environment has assumed even greater importance, not least as a consequence of the commitments made by States to apply the principles of sustainable development embodied in instruments such as the Rio Declaration on Environment and Development,[1] which, while not legally binding, reflect political consensus on the need to consider environmental protection an integral part of the development process.

6. The emphasis on the protection of the marine environment is reflected in the 1994 Agreement, which, inter alia, gives priority to the adoption of rules, regulations and procedures incorporating applicable standards for the protection and preservation of the marine environment[2] and requires that an application for approval of a plan of work for exploration is accompanied by an assessment of the potential environmental impacts of the proposed exploration activities and a description of a programme for oceanographic and baseline environmental studies.[3]

7. The provisions of the Convention and the Agreement were applied in the Regulations on Prospecting and Exploration for Polymetallic Nodules in the Area (hereinafter "the nodules regulations"), adopted by the Authority in 2000.[4] Firstly, the Authority is under a duty to establish and keep under periodic review environmental rules, regulations and procedures to ensure effective protection for the marine environment from harmful effects which may arise from activities in the Area.[5] Secondly, the Authority and sponsoring States are required to apply a precautionary approach, as reflected in principle 15 of the Rio Declaration,[1] to activities in the Area. The Legal and Technical Commission is to make recommendations to the Council on the implementation of this requirement. Thirdly, the Regulations impose a duty on each contractor to "take necessary measures to prevent, reduce and control pollution and other hazards to the marine environment arising from its activities in the Area as far as reasonably possible using the best technology available to it".[6]

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[1] See *Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992* (United Nations publication, Sales No. E.93.I.8 and corrigenda), vol. I: *Resolutions adopted by the Conference*, resolution 1, annex I.

[2] General Assembly resolution 48/263, annex, section 1, para. 5 (g).

[3] Ibid., para. 7.

[4] ISBA/6/A/18.

[5] Regulation 31, para. 1. See also the United Nations Convention on the Law of the Sea of 10 December 1982, article 165, paras. (2) (e), (f) and (h), and annex III, article 17, paras. 1 (b) (xii) and 2 (f); 1994 Agreement, annex, section 1, para. 5 (g). Regulation 1, para. 5 also provides that the Regulations may be supplemented by further rules, regulations and procedures, in particular on the protection and preservation of the marine environment.

[6] Regulation 31, para. 3. This duty is said to exist pursuant to article 145 of the Convention and paragraph 2 of regulation 31, i.e. the application of the precautionary approach.

8. In relation to contractors, the specific content of the above-mentioned duty is elaborated in the nodules regulations and in the standard clauses for exploration contracts (annex 4 of the nodules regulations), as well as in the recommendations for the guidance of the contractors for the assessment of the possible environmental impacts arising from exploration for polymetallic nodules in the Area issued by the Legal and Technical Commission in 2001.[7] In summary, the contractor is required to gather environmental baseline data as exploration activities progress and to establish environmental baselines against which to assess the likely effects of its activities on the marine environment.[8] Implicit in this is a requirement for the contractor to establish and implement a programme to monitor and report on such effects.

9. The above obligations need to be seen in the context of the anticipated physical activities involved in the process of exploration for polymetallic nodules. It is widely accepted that, during the initial phase of exploration, there would be little, if any, impact on the marine environment. Most exploration work is likely to be non-invasive, relying primarily on remote sensing and standard sampling techniques. Indeed, the recommendations for guidance issued by the Legal and Technical Commission list a number of activities that are deemed to have no potential for causing any adverse effect on the marine environment. At the same time, however, the nodules regulations recognize that a secondary phase of exploration begins with the testing of collecting systems and processing operations. At that time, the contractor will be required to submit a site-specific environmental impact assessment and a proposal for a monitoring programme to determine the effect on the marine environment of the equipment that will be used during the mining tests.

10. The next part of the present paper is a summary on the potential environmental impacts that might occur as a result of prospecting or exploration for polymetallic sulphides or cobalt-rich crusts. The summary is based on a synthesis of the proceedings of three workshops convened by the Authority and directly concerned with exploration for sulphides and crusts in the Area. The workshops, each of which was attended by leading scientists in the field, were dedicated to the following themes:

(a) Minerals other than polymetallic nodules in the international seabed area (26-30 June 2000);

(b) The environment of polymetallic sulphides and cobalt-rich crusts and considerations for the establishment of environmental baselines and an associated monitoring programme for exploration (6-9 September 2004);

(c) Cobalt-rich crusts and the diversity and distribution patterns of seamount fauna (27-31 March 2006).

[7] ISBA/7/LTC/1/Rev.1 and Corr.1.

[8] Regulation 31, para. 4 and annex 4, para. 5.2. In addition, the nodules regulations require applicants seeking approval of a plan of work for exploration to submit, at the application stage, a description of the programme for environmental baseline studies; see General Assembly resolution 48/263, annex, section 1, para. 7 and Regulation 18 (b) and annex 2, para. 24 (b).

III. Potential environmental impacts from exploration for polymetallic sulphides and cobalt-rich ferromanganese crusts

11. Many of the environmental impacts that would occur as a result of commercial activity associated with polymetallic sulphides or cobalt-rich crusts would be similar to those experienced by communities as a result of exploration for polymetallic nodules. There are likely to be some distinctions as a result of differences in the environments where the three types of resources are found. It should be noted that the proceedings of the workshops reflected developments in scientific knowledge since the nodules regulations were adopted in 2000.

12. The purposes of the 2004 workshop were to: increase understanding of the potential impact of exploration for polymetallic sulphides and cobalt-rich crusts; determine which baseline studies would be required; ascertain the relevance of current and past research programmes; design a prototype environmental monitoring programme to be carried out during exploration for resources; determine any potential areas for collaboration to reduce the costs for potential contractors; and make proposals to assist the Legal and Technical Commission when developing guidance for contractors on the establishment of environmental baselines and monitoring programmes. One of the key conclusions from the 2004 workshop was that not enough was known about the patterns of diversity and endemism at seamounts, the environments in which cobalt-rich crusts are found. For that reason, the 2006 workshop was aimed at assessing patterns of diversity and endemism of seamount fauna and examining gaps in current knowledge of those patterns with a view to encouraging collaborative research to address them.

13. It is apparent that, since the nodules regulations were adopted in 2000, there has been an increase in scientific understanding of the environments in which the various types of resources are found. The environments in which sulphides and crusts occur are very different to those where polymetallic nodules are found. Polymetallic nodules are found on abyssal plains, which are without boundaries for the potential scale of mining, whereas both hydrothermal vents (the location of polymetallic sulphides) and seamounts (cobalt-rich crusts) are smaller-scale environments with distinct boundaries. This factor alone has profound implications for recolonization after disturbance.

A. Cobalt-rich crusts

14. The distinct character of both hydrothermal vents and seamounts results in a level of species endemism that is higher than that found on the abyssal plain. Endemism is a measure of the distribution of a particular organism. High endemism means that many organisms occur only in that region. The region in question can be a particular part of a seamount, an individual seamount, a single chain of seamounts or even a whole ocean. Endemism is known to be particularly high on seamounts as a result of the enhanced currents that are associated with such features as well as their topographic isolation. Although test mining may physically affect only a localized area, the sensitivity of the ecosystem to the disturbance is a function of the degree and scale of endemism. Most marine fauna have a limited depth range; hence, if the seamount on which they are found extends beyond that range, they will

be confined to it. The exception is when organisms are carried away from the seamount, often as larvae, but such a phenomenon is limited because of the circulatory current regime found on many seamounts. The same strong boundary currents could mean that any plume produced as a result of mining could be prevented from escaping the seamount. While that would reduce the impact on surrounding seamounts, it would also result in a greater local impact. On the other hand, it has been noted that mining for cobalt-rich crusts is likely to produce less of a plume than mining for manganese nodules, because seamounts are often characterized by low levels of sedimentation as a result of the increased current flows, while cobalt-rich crusts are usually found where sedimentation is reduced. However, the extent of the sediment plume created clearly depends on the mining techniques, which remain largely unknown, and on localized conditions.

15. Megafauna associated with crusts tend to be characterized by sessile filter feeders rather than by the mobile deposit feeders that have been associated with nodules. This fact has implications for recolonization after impact, as organisms with sessile adult stages are obviously not as capable of recolonization after disturbance as species that are fully mobile. In addition, filter feeders are more at risk from a sediment plume than deposit feeders, as their feeding apparatus could be clogged by a plume (although the food supply for deposit feeders would be reduced where a plume settles, so they are by no means immune from impact either).

16. Location (latitude, longitude and depth) has been shown to be a key driving factor in the community structure of many organisms on seamounts (many species are endemic to a single seamount or group of seamounts). Biological communities have also been shown to be influenced by the depth of the oxygen minimum zone relevant to the seamount and the substrate on which they live. Though this has been shown for many organisms, specific examples using ophiuroids (brittle stars) and porifera (sponges) were shown at the 2006 workshop. It was considered that further studies were required to fully evaluate endemism on seamounts and that genetic studies should play a large role in that work. It was also noted that a global dataset was needed because, given the enormous variation between seamounts, local scale patterns should not be scaled up to make global analysis.

17. A common theme expressed by many leading scientists is that few of the known seamounts have been extensively sampled. Where it has been conducted, sampling has been most intense in shallow depths and mid-latitudes, even though most seamounts are known to occur at intermediate depths and are more common near the equator. It is indeed the understudied equatorial region that has the most potential for crust mining. At the 2006 workshop, it was noted that mining is most likely to occur above a water depth of 2,000 metres, which is also the area of the greatest coral abundance and diversity. According to the scientists questioned, there have to date been no detailed biological studies of communities associated with cobalt-rich crusts.

B. Polymetallic sulphides

18. Deposits of polymetallic sulphides are associated with extinct or active hydrothermal springs that occur on the seafloor in areas of active volcanism, at spreading ridges, back-arc subduction zones and flanks of intraplate volcanoes at depths of 1,400 to 3,500 metres. Based on the data currently available, about 100

sites of seafloor hydrothermal mineralization (potential mine sites of polymetallic sulphides deposits) have been discovered. Although information on the thickness of most occurrences is yet to be established, it is estimated that about 12 of them might have sufficient size and grade to be considered for mining in the future.[9] Of the 12 sites, only two are in the Area. Such a distribution of hydrothermal mineralization is not a result of preferential geological settings in marine areas within national jurisdiction, but of the greater efforts expended in marine scientific research in such areas. It suggests that since over 80 per cent of the approximately 60,000 kilometres of the geographic province that contains seafloor spreading centres are in the Area, increased marine scientific research would lead to further discoveries there.

19. A particularly close relationship exists among minerals, microbes, meiofauna and macrofauna in the case of polymetallic massive sulphide deposits that are deposited by metal-rich hot springs associated with volcanic activity at plate boundaries. The hot springs not only concentrate polymetallic massive sulphides deposits and disperse metals into the oceans, thereby contributing to the accumulation of cobalt-rich ferromanganese crusts and polymetallic manganese nodules, but also provide chemical energy from the Earth's interior that is used by microbes for growth. Microbes are at the base of the food chain of an ecosystem of life forms at the hot springs that is largely independent of the light energy that fuels the photosynthesis in plants at the base of the food chain on land. Some such microbes are proving important as the source of new compounds for industrial and medical applications.

20. In general, deposits of sulphides on slow spreading ridges are larger than those on fast spreading ridges. The former are also the longest-living and most stable, so they may form a centre from which species can migrate to other regions. For this reason, the impact on communities on slow spreading ridges may have wider implications; it would be important to know whether a given population serves as a critical brood stock for others. On the other hand, as ridges spread, active hydrothermal systems would remain near the ridge along with their associated biological communities, but the sulphide deposits would migrate away from the ridge and be considered as inactive deposits.

21. It has been suggested that commercial mining activity would concentrate on inactive deposits, since the unstable conditions surrounding active vents are not conducive to commercial activity. This would also avoid causing damage to hydrothermal vent fauna at active vents. Biological communities at inactive sites are relatively unknown. For that reason, it is difficult to predict the likely impact of exploration on them. Nevertheless, inactive sulphide deposits are expected to contain an important fossil record, while exploration could have a positive effect by increasing knowledge of hydrothermal vent communities, particularly ancient ones. Another concern expressed at the 2004 workshop was how to distinguish between inactive and dormant deposits, since the latter could be reactivated as a result of commercial activity, which could have both a positive and a negative impact.

[9] See Herzig, P., S. Petersen and Mark Hannington, "Seafloor massive sulphide deposits and their resource potential", chap. 2, proceedings of the International Seabed Authority workshop, Kingston, 26-30 June 2000. See also chap. 6. Juniper, S.K., "Impact of the development of seafloor massive sulphides on deep-sea hydrothermal vent ecosystems".

22. In the final analysis, the nature of environmental considerations associated with the test mining of polymetallic sulphides and cobalt-rich crust deposits will depend on the type of mining technology used and on the scale of the operation, factors which remain largely unknown at present. In the meantime, it will be important to obtain sufficient information from potential test-mining sites to document the natural conditions that exist prior to test mining in order to gain an insight into natural processes, such as the dispersion and settling of particles and benthic faunal succession. Quantitative sampling of hard substratum environments (for example, polymetallic sulphides, cobalt-rich crusts and basalt) in the deep sea is something that academic scientists do not routinely achieve. The presence of small animals, or animals hidden in crevices (for example in coral) would require several types of sampling equipment. The impact of naturally occurring periodic processes on the marine environment may be significant but are not currently well quantified. It is thus also important to acquire as long a history as possible of the natural responses of surface and benthic communities to those processes.

23. It can be expected that the detailed recommendations of the workshops will be taken up by the Legal and Technical Commission when it considers recommendations for the guidance of contractors pursuant to regulation 41 of the draft regulations. An initial draft of such recommendations, indicating the suite of information that should be collected in order to monitor any impact on the environment from exploration for sulphides and crusts, was considered by the Commission at its eleventh session (ISBA/11/LTC/2). One of the most important components of the recommendations was that such environmental data should not be considered commercially sensitive and as such should be open to review and comparison by independent scientists.

IV. Provisions of the draft regulations

24. In general, the provisions of the draft regulations follow those of the nodules regulations. With respect to the specific provisions relating to protection of the environment on which the Council requested further guidance (draft regulations 33 to 36), two specific changes were proposed by the Legal and Technical Commission.

25. The first change was to adjust the timing of the obligation on contractors to set aside areas as impact reference zones and preservation reference zones. “Impact reference zones” means areas to be used for assessing the effect of activities in the Area on the marine environment and that are representative of the environmental characteristics of the Area. “Preservation reference zones” means areas in which no mining is to be conducted in order to ensure representative and stable biota of the seabed and therefore allow assessment of any changes in the flora and fauna of the marine environment. In the nodules regulations, the obligation to propose such zones appears in regulation 31, paragraph 7, but only becomes effective at the stage when the contractor applies for exploitation rights. This is consistent with the progressive approach to environmental protection taken in the nodules regulations described in paragraph 9 above. The primary phase of exploration is expected to have little or no adverse environmental impact. At the secondary phase of exploration (testing of collecting systems and processing operations), the contractor is required to submit a site-specific environmental impact assessment and a proposal for a monitoring programme. During the third phase (exploitation), more stringent environmental regulation is envisaged.

26. In the draft regulations (regulation 33, para. 4), owing to the different characteristics of the environment within which sulphides and crusts deposits occur, the obligation to propose set-aside areas is brought forward to the preliminary phase of exploration. Such areas are to be proposed as part of the monitoring programmes that are required of all contractors, but only "when required by the Authority". The proposed change is 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. The revised provision reads in full as follows:

> "4. Contractors, sponsoring States and other interested States or entities shall cooperate with the Authority in the establishment and implementation of programmes for monitoring and evaluating the impacts of deep seabed mining on the marine environment. When required by the Authority, such programmes shall include proposals for areas to be set aside and used exclusively as impact reference zones and preservation reference zones. 'Impact reference zones' means areas to be used for assessing the effect of activities in the Area on the marine environment and which are representative of the environmental characteristics of the Area. 'Preservation reference zones' means areas in which no mining shall occur to ensure representative and stable biota of the seabed in order to assess any changes in the flora and fauna of the marine environment."

In addition, the contractual obligation in the standard clauses for exploration contracts (annex 4, para. 5.2) to develop environmental baselines for the purposes of impact assessment has been strengthened. Under the draft regulations, contractors would be required, prior to the commencement of exploration activities under the contract, to submit an impact assessment, a proposal for a monitoring programme and environmental baseline data.

27. The second change proposed by the Legal and Technical Commission was to adjust the threshold at which certain types of precautionary action must be taken, from events that are "likely to cause serious harm to the marine environment" to events that pose "a threat of serious harm to the marine environment". The use of such terms requires some explanation.

28. It will be recalled that, as far as the Authority is concerned, the primary obligation in the Convention is to ensure the "effective protection for the marine environment from harmful effects" from seabed mining (art. 145). Under both sets of regulations, the primary tool by which this protection from harmful effects is to be achieved is the application of the precautionary approach as reflected in principle 15 of the Rio Declaration,[1] which states:

> "In 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."

It is clearly arguable that the Convention language of "harmful effects" establishes a lower threshold for action, and thus confers greater protection on the marine environment than principle 15 of the Rio Declaration, which requires that there be a threat of "serious or irreversible damage" before lack of full scientific certainty may

be used as a reason for postponing measures. Nevertheless, it may be argued that consistency is achieved by the definition of the term “serious harm to the marine environment” in regulation 1 as a proxy for the “harmful effects” referred to in article 145 of the Convention.

29. In considering the draft regulations, the Legal and Technical Commission considered that the use of the term “likely to cause serious harm” as a trigger for action to be taken in pursuance of a precautionary approach implied a degree of certainty that was incompatible with the precautionary approach, which requires that there be only a threat of serious damage. Adjustments were made accordingly to regulations 35 and 36.