Report of the expert meeting on the feasibility of applying rule-based management approaches to Regional Environmental Planning of the International Seabed Authority with a Focus on Polymetallic Sulphide Deposits in Mid-Ocean Ridges

Paris, 28 - 30 May 2019

Organized by the Atlantic REMP Project, in collaboration with the International Seabed Authority

Sponsored by the European Commission

REPORT OF THE EXPERT MEETING ON THE FEASIBILITY OF APPLYING RULE-BASED MANAGEMENT APPROACHES[1] TO REGIONAL ENVIRONMENTAL MANAGEMENT PLANNING OF THE INTERNATIONAL SEABED AUTHORITY WITH A FOCUS ON POLYMETALLIC SULPHIDE DEPOSITS IN MID-OCEAN RIDGES

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INTRODUCTION

1. The International Seabed Authority (ISA), on behalf of the States Parties to the United Nations Convention on the Law of the Sea (the Convention), is mandated to administer the mineral resources of, and control and organize current exploration activities, as well as future mining activities, in the seabed and ocean floor and subsoil thereof, beyond the limits of national jurisdiction (the 'Area') for the benefit of (hu)mankind as a whole. In accordance with article 145 of the Convention, and with respect to activities in the Area, the ISA is mandated to take the measures necessary to ensure effective protection for the marine environment from harmful effects and to adopt appropriate rules, regulations and procedures for, *inter alia*, the prevention, reduction and control of pollution and other hazards to the marine environment, 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.

2. In line with the above-noted mandates, the ISA is in the process of developing regional environmental management plans (REMPs) with the objective to provide the relevant organs of the ISA, as well as contractors and their sponsoring States, with proactive management tools to support informed decision-making that balances resource development with protection of the marine environment. As such, REMPs will form an important part of the ISA's policy framework for environmental management in the Area and will guide contractors and researchers in the collection of environmental data needed to manage deep-sea mining and related activities in the Area. REMPs will also provide the ISA with a clear and consistent mechanism to identify areas thought to be representative of the full range of habitats, biodiversity and ecosystem structures and functions within the relevant management areas, and provide those areas with appropriate levels of protection.

3. Within this context, the Atlantic REMP Project[2], funded by the European Commission (EC), provides scientific and technical support to the secretariat of the ISA in facilitating the development of a REMP for the Area in the Atlantic Ocean. As part of this partnership, *'The expert meeting on the feasibility of applying rule-based management approaches to regional environmental management planning of the International Seabed Authority with a focus on polymetallic sulphides in mid-ocean ridges'* was convened by the secretariat of the Atlantic REMP Project, in collaboration with the ISA secretariat, and with the financial support of the EC.

4. The meeting was attended by 29 participants in their individual expert capacities. The full list of participants is provided in annex I to this report.

[1] The meeting noted that the term 'rule-based management approaches' is not immediately transferable to the ISA regulatory framework, where the Mining Code (Regulations, Standards, Guidelines, rules and procedures) will form the basis of the ISA's environmental management measures. Within the context of ISA REMPs, 'rules-based management approaches' should be replaced with 'environmental management measures', to be compatible with the ISA regulatory framework and to capture the original intention of its use.

[2] The Atlantic REMP Project (Areas of Particular Environmental Interest in the North Atlantic) is funded through contract number EASME/EMFF/2017/1.3.1.1 – S12.775068.

I. OPENING OF THE MEETING

5. Phil Weaver, Coordinator of the Atlantic REMP Project, delivered opening remarks, welcoming participants, acknowledging the financial support of the EC for the meeting as part of the Atlantic REMP Project, and expressing his appreciation to the ISA secretariat for collaboration. He then invited all the participants to introduce themselves.

II. BACKGROUND, OBJECTIVES AND EXPECTED OUTPUTS/OUTCOMES OF THE MEETING

6. In pursuance of the ISA's mandate noted in the above paragraph 1 in accordance with article 145 of the Convention, the Council approved an environmental management plan for the Clarion-Clipperton Zone at its eighteenth session, in 2012, on the basis of a recommendation of the Legal and Technical Commission (see ISBA/17/LTC/7, ISBA/17/C/19 and ISBA/18/C/22). The plan included the designation of a network of nine areas of particular environmental interest (APEIs) that are protected from exploitation activities.

7. At the ISA workshop on '*Developing a Framework for Regional Environmental Management Plans (REMPs) for Polymetallic Sulphide Deposits in Mid-Ocean Ridges*' held in Szczecin, Poland in June 2018, participants discussed the benefits of identifying potential management measures that could complement existing approaches for APEIs. Particular interest was expressed in exploring environmental management measures (tentatively termed as 'rule-based management approaches' at the Szczecin workshop, which was carried over to this expert meeting) that could span the axis of the mid-ocean ridge (MOR), in view of its specific ecosystem characteristics and features.

8. In this context, at the above-noted Szczecin workshop, consideration was given to the potential of additional management measures that may be beneficial for REMP development, complementing APEIs, including the possibility of rule-based management approaches.

9. This meeting was therefore convened by the Atlantic REMP Project, in collaboration with the ISA secretariat, with the following initial objectives:

(a) To describe what is meant by rule-based management approaches;

(b) To present examples of how rule-based management works in other industries, including case studies on successful application and failures as well as lessons learned;

(c) To discuss the feasibility of applying rule-based management approaches to REMPs within the context of the ISA with a focus on polymetallic sulphide deposits (PMS) on MORs, including possible constraints and opportunities; and

(d) To discuss how the application and implementation of rule-based management approaches could be aligned with the development of Draft Regulations on the Exploitation of Mineral resources in the Area (the Draft Regulations), including associated ISA Standards and Guidelines.

10. Participants heard the following presentations, which provided overall context for this meeting:

(a) The ISA's approach for the development of REMPs;

(b) Advances in the ISA's legal regime to regulate exploitation of mineral resources in the Area, including updates on the results of the ISA technical workshop on Standards and Guidelines held in Pretoria, South Africa, in May 2019;

(c) Progress in scientific data compilation and assessment in support of the ISA's development of a REMP in the North Atlantic;

(d) The potential mineral resources of the MOR in the North Atlantic; and

(e) Ecosystems of the MOR in the North Atlantic.

11. Summaries of these presentations are provided in annex II to this report.

12. Through initial exchange of views and insights following the above-noted presentations, the meeting noted that the term 'rule-based management approaches' is not immediately transferable to the ISA regulatory framework, where the Mining Code (Regulations, Standards, Guidelines, rules and procedures) will form the basis of the ISA's environmental management measures. Within the context of ISA REMPs, 'rule-based management approaches' should be replaced with 'environmental management measures', to capture the original intention of the terms' use, and to reflect the breadth of the ISA regulatory framework. The term 'rules-based approaches' was used in this meeting for the purpose of sharing experiences and lessons learned from other industries.

13. In the interests of clarity, participants noted that where 'regulations', 'standards' and 'guidelines' are referred to in this meeting, these relate to occurrences in other industries. Where 'Regulations', 'Standards' and 'Guidelines' are mentioned, this is in specific reference to the ISA regulatory framework.

III. SHARE EXPERIENCE AND LESSONS LEARNED IN THE APPLICATION OF RULE-BASED APPROACHES FOR ENVIRONMENTAL MANAGEMENT IN OTHER INDUSTRY SECTORS

13. Under this item, participants had before them a background information document prepared for this meeting by the Atlantic REMP Project, which was circulated to participants for their information prior to the meeting.

14. Participants heard the following presentations:

(a) Overview of case-studies on the application of rule-based approaches for environmental management in other industry sectors and lessons learned;

(b) Case studies: Deep-water fisheries management;

(c) Case studies: Deep-water oil and gas production;

(d) Case studies: International Finance and its environmental management requirements;

(e) Case studies: International Maritime Organization (IMO) Ballast water and London Convention/London Protocol waste management regulations; and

(f) Case studies: Offshore dredging industry.

15. Summaries of the above presentations are provided in annex II to this report.

16. Results of Plenary discussion under this agenda item are summarized in annex III to this report.

IV. APPROACHES TO ENHANCE MANAGEMENT MEASURES IN REGIONAL ENVIRONMENTAL MANAGEMENT PLANS BUILDING ON THE EXPERIENCE OF OTHER INDUSTRIES

17. Under this item, two break-out sessions were organized. For each break-out session, participants were split into two groups, considering their diverse expertise and experience.

18. For the first break-out session, participants in both groups focused on '*Consolidating lessons learned and identifying elements that can be applied to the Area, in particular activities relating to polymetallic sulphide deposits on mid-ocean ridges'*, as moderated by Georgy Cherkashov and Pierre-Marie Sarradin, with the assistance of Wanfei Qiu and Amber Cobley as rapporteurs, respectively.

19. For the second break-out session, as moderated by Adam Cook and Chris Hauton with the assistance of Rachel Boschen-Rose and Amber Cobley as rapporteurs, participants in both groups focused on identifying:

(a) A list of key questions that may need to be considered in developing an Atlantic REMP for sulphides along the Mid-Atlantic Ridge (MAR);

(b) Reasons why these questions may need to be considered; and

(c) Experience and lessons learned from other industries relevant to addressing these questions.

20. The results of the two break-out sessions were presented at the Plenary meeting, which was ensued by further discussion.

21. Results of the discussion during the two break-out sessions and the Plenary meeting under this agenda item are summarized in annex IV to this report.

V. SUMMARY AND CONCLUSION

22. The participants reviewed the draft meeting report as prepared and presented jointly by secretariats of the Atlantic REMP Project and the ISA.

23. The participants agreed that any additional factual correction and clarification would be provided to the secretariats of the Atlantic REMP Project and the ISA within two weeks of the closing of the meeting.

24. The participants were appreciative of the timely production of a draft meeting report, and supported the report of the meeting being widely distributed.

25. Results of the closing discussion are summarized in annex V to this report.

VI. CLOSURE OF THE MEETING

26. In closing the meeting, the organizer thanked the meeting participants for their active and valuable contributions; speakers for providing excellent presentations; the EC for sponsoring the meeting; moderators and rapporteurs for their effective facilitation of the meeting discussion and assisting the secretariats in preparing the draft report; and the secretariats of Atlantic REMP Project and ISA for efficiently servicing the meeting and preparing a draft report in a timely manner.

27. The participants found the meeting to be very informative, and many expressed their gratitude for the opportunity to learn from the environmental management measures used by other industries. The participants from other industries also appreciated the opportunity to better understand the environmental management needs of the ISA. Participants expressed the desire for the meeting report to be disseminated widely, including through ISA website.

28. The meeting was closed at 12 pm on 30 May 2019.

Annex I

LIST OF PARTICIPANTS[3]

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11	Jasiński, Bartosz	Ministry of the Environment, Poland	bartosz.jasinski@mos.gov.pl

[3] The gender ratio of this meeting was 0.41: 0.59, with 12 female and 17 male meeting participants.

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27	Van Dover, Cindy	Duke University, USA	c.vandover@duke.edu
28	Vivian, Chris	Cefas (retired), Member of the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP)	chris.vivian2@btinternet.com
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Annex II

SUMMARIES OF PRESENTATIONS UNDER AGENDA ITEMS II & III

Presentations delivered under agenda item 2

1. The ISA's approach to the development of regional environmental management plans (REMPs)

Presenter: Jihyun Lee, ISA secretariat

The work undertaken by ISA in past 25 years under the mandate of United Nations Convention on the Law of the Sea for the protection of the marine environment (Article 145 of the Convention) provides a valuable example of applying the precautionary approach to regulating human activities. Building on this mandate, the ISA Strategic Plan (2019-2023) elaborates the specific approaches and measures for the protection of the marine environment in Strategic Direction 3 (Protect the marine environment). Strategic Direction 3 focusses on the development of an adaptive, practical and technically feasible regulatory framework; regional environmental management plans; environmental impact/risk assessment; environmental monitoring and modeling; and data management and information access.

Scientific data/information being provided by contractors through their exploration activities critically underpins the effective implementation of the ISA's environmental management framework, together with scientific analysis, modeling and observations being undertaken by other scientific groups. The data submitted by contractors are now compiled and collated through the ISA database, where environmental data will be publicly available in July 2019 after the database public launch.

REMPs will provide for an effective policy instrument to facilitate the implementation of the Draft Regulations on Exploitation of Mineral Resources in the Area (Draft Regulations), and associated Standards and Guidelines. Scientific collaboration among contractors and relevant scientific groups will be the key to successful development of REMPs, which is planned for 2019-2020. Similarly, the ISA will apply coherent and coordinated approaches at various steps of REMP development, including information gathering, analysis, workshop discussion, post-workshop review, and the review by ISA organs, to ensure effective and meaningful engagement of stakeholders in a transparent manner within the auspices of the ISA.

2. Advances in the ISA's legal regime to regulate exploitation of mineral resources in the Area

Presenter: Elie Jarmache, Legal and Technical Commission of the ISA

There has been increasing interest in exploration of deep sea mineral resources, with a total of 29 exploration contracts currently in place. The key considerations for exploration contracts include geological, technological, environmental, economic and regulatory factors. Building on the knowledge from regulating exploration activities, the ISA is in the process of developing the Draft Regulations, with a view for the Draft Regulations to be adopted by the Council in July 2020. The Draft Regulations set out, *inter alia,* fundamental rights and obligations between the ISA and future mining operators, and the processes for the application of, as well as following, approval for a plan of work for exploitation in the Area.

The Draft Regulations will be supplemented by a set of Standards and Guidelines, as a contribution to the development of regulations. A recent workshop held in Pretoria, South Africa, in May 2019, on the development of ISA Standards and Guidelines highlighted advantages of an outcome-based approach, focusing on the desired outcomes or thresholds, while affording flexibility and encouraging innovation in the processes employed to achieve those outcomes. The workshop also discussed experiences in

developing standards and guidelines in other industries and in national contexts, and a need for specific environmental conditions/thresholds to be included in exploitation contracts. The outputs of the workshop include a prioritized list of Standards and Guidelines, to be developed in three phases, and a process flowchart for the development of Standards and Guidelines, including opportunities for stakeholder engagement.

The next steps for the development of the Draft Regulations include continued discussion of the regulatory text, the crafting of financial terms for contracts, interfacing with sponsoring States and relevant international organizations, developing a work program for fit-for-purpose Standards and Guidelines, and designing a robust monitoring, inspection and compliance mechanism.

3. Progress in scientific data compilation and assessment in support of the ISA's development of a REMP in the North Atlantic

Presenter: Phil Weaver, Seascape Consultants

PMS differs significantly from manganese nodules and cobalt crusts as a resource, being three-dimensional ore bodies, analogous to sulphide deposits on land. Consequently, the mine sizes will be relatively small, perhaps a few square kilometers, and mining could remain at the same location for several years. There is potential for a small number of large ore bodies to be mined in the North Atlantic. Unique to PMS deposits, however, are hydrothermal vent biological communities that are located on active vent sites distributed along the ridge axis. These organisms occur in restricted locations and may need enhanced management to prevent significant impacts. Other organisms such as coral and sponges may occur on or close to mined areas and may also need to be managed if they are exposed to plumes that may spread particulates and toxic metals in low concentrations over wider areas.

Data collected in the vicinity of the MAR system over the last few years have been used by scientists to suggest options for the design a network of APEIs. The locations of such APEIs, although somewhat flexible in position, could conflict with areas of exploration, and thus options in addition to APEIs for management along the ridge axis may need to be examined.

4. The potential resource of the MOR in the North Atlantic

Presenter: Georgy Cherkashov

Our understanding of the distribution of hydrothermal fields and PMS deposits along the MAR is linked to the degree of study along different segments of the ridge. The better-studied Northern Equatorial part of the MAR is characterized by various parameters of PMS distribution. Within the segment between the Azores and 10°N there are 20 separate hydrothermal fields. The average distance between each site is approximately 100 km, which is similar to the global distribution along MORs (German et al., 2016), although the distribution of PMS deposits along the MAR demonstrates high variability. This variability of PMS distribution along the MAR is important not only for the estimation of PMS resource potential but also for the development of a REMP and for the designation of APEIs.

The uncertainties of PMS distribution can be explained by a number of factors, including the absence of systematic studies of hydrothermal vents/PMS distribution along MAR before 2011, which is related to the issuance of the ISA Regulations for exploration for PMS. As a result, all sites to the North of 21°N were discovered 'by chance' before 2000. There are very few detailed studies, like the studies at the TAG site. To date, the Polish exploration program has only recently started, and there are very limited data available for the French Exploration Area (FEA), where approximately 20 targets (plumes) were detected (Pelleter, 2018). The Russian exploration program is also far from complete. Current known sites only

account for approximately 20-30% of the predicted total for the MAR, meaning many vent sites remain to be discovered (Beaulieu et al., 2015).

Resource estimation depends on multiple factors/parameters, including the morphology of PMS deposits; the amount of low-temperature non-sulfide minerals within the ore body; zonality of the ore body ('zone refining' results in enrichment of Cu and Zn of outer parts of deposit); and continuation (or not) of the ore body below 'paleo-seafloor'. Current resource estimation of PMS deposits in the North Atlantic (first hundreds of million tonnes) is not reliable and could be increased dramatically (2-3 times higher) as a result of extension of the exploration area (through increasing the exploration corridor up to 20 km). Equally, resource estimates could decrease as a result of drilling SMS deposits outcropping on the sea floor. Due to the absence of an economic model for PMS mining, it is not possible to determine the level of resources which could be commercially interesting for future exploitation. The suggested profitable level of annual polymetallic nodule production (3 million tonnes per year) is not applicable for PMS.

Determining the scenario for exploitation, along with the regulatory needs and estimation of environmental impacts, should take into consideration the differences between active and inactive PMS deposits. The distance between active and inactive sites varies from tens of meters to tens of kilometers, and the resources of inactive PMS deposits are larger than active ones, although this is still under discussion.

5. Ecosystems of the MOR in the North Atlantic

Presenter: Cindy Van Dover, Duke University.

The MAR is a complex system, with a topographically and geologically complex axial valley, along-axis segmentation with basins and sills, transform faults, seamounts, submerged islands, abyssal hills, etc., all of which are ecologically distinctive habitats. Hard substratum may be limited to a relatively narrow corridor along the MAR and will support suspension-feeding faunas. Active hydrothermal vents on the MAR are extremely rare habitats in areal extent; no two vents are alike and diverse extreme environments on the MAR are engines that fuel evolution of novel adaptations. Pelagic, sediment, and inactive sulfide ecosystems associated with the MAR are extremely poorly studied and understood. Biophysical processes subdivide the MAR into natural biogeographic and population units, though the extent and boundaries of these units are not yet well defined. Source-sink dynamics matter for fragmented populations and communities. Understanding microbial biodiversity and functions is also critical in identifying areas at risk of serious harm or vulnerable marine ecosystems relating to activities in the Area. Development of REMPs requires an understanding of conservation goals and objectives. Spatial management approaches (including but not limited to networks of APEIs) are critical for protecting representative habitats on the MAR, including axial valleys. Considerations to ensure protection of potential areas at risk of serious harm within contractor areas would be required in the REMP development.

Presentations delivered under agenda item 3

6. Overview of case-studies on the application of rule-based approaches for environmental management in other industry sectors and lessons learned

Presenter: Kevin Murphy, Environmental Resources Management (ERM)

Rule-based management of environmental performance is not new and is applied to aspects of environmental management in most marine industrial sectors. Rules stem from existing regulations, standards and guidelines, experience in other industries and other national jurisdictions. Some rules emerge from strategic or regional environmental assessment processes. Project and site-specific rules often result from the Environmental Impact Assessment (EIA) process. Rule-based approaches to aspects of environmental management have been demonstrated to be effective and accepted by industry.

7. Case studies: Deep-water fisheries management

Presenter: Kevin Murphy, ERM

The regulatory framework for deep seas fisheries is provided by the Food and Agriculture Organization of the United Nations (FAO) International Guidelines for the Management of Deep-sea Fisheries in the High Seas. The aim of the guidelines is to assist States in implementing United Nations General Assembly resolutions on 'sustainable fisheries'including preventing significant effects on Vulnerable Marine Ecosystems (VMEs). Where a VME is identified, it is usually closed to all forms of bottom fishing. Procedures are applied in terms of the 'move on rule' for when potential VMEs are encountered. These typically include action thresholds for the amounts of VME indicator species (e.g. corals) captured in a trawl and the move on distance. Other requirements include conducting EIAs in advance of opening new areas to fisheries.

The application of the rules varies between regions, and while monitoring and enforcement measures are taken by the Regional Fisheries Management Organizations (RFMOs) several issues have been noted. These include a lack of scientific basis for the species thresholds that trigger the 'move-on-rule'; and that EIAs are not always undertaken and may be of poor quality. Overall analysis of the performance of RFMOs indicates a significant gap between organizational intent and actual fisheries management outcomes, largely a reflection of the challenges of management and monitoring activities that are taking place in multiple locations over large remote areas.

8. Case studies: Deep-water oil and gas production

Presenter: Wendy Brown, International Association of Oil & Gas Producers (IOGP)

IOGP is the 'global voice of the upstream oil and gas industry', which works on behalf of the world's oil and gas companies and organizations to promote safe, responsible and sustainable Exploration and Production (E&P). IOGP has 14 standing committees including an Environment Committee which generates environmental good practice guidance[4]. IOGP also represents industry in regional seas and international conventions, and co-ordinates various Joint Industry Programs (JIPs) such as the E&P Sound and Marine Life Program[5] which conducts independent scientific research to help increase understanding of the effect of sound on marine life generated by oil and gas E&P activity.

An overview of the E&P lifecycle was provided covering the different activities at each phase from exploration/appraisal, through project development and operations, to cessation of production, together with the potential environmental aspects associated with these activities. An overview was also provided of the main environmental management processes generally used by the oil and gas industry to identify and manage potential project-related environmental impacts throughout the life cycle of an upstream oil and gas development, and how these are typically embedded in the overall operating management system, which is aligned with IOGP's Operating Management System (OMS) framework and ISO14001:2015 Environmental Management System (EMS) standard. The key risk management approaches utilized were covered including the risk-based approach and the mitigation hierarchy – a tool to help manage the risks and potential negative environmental impacts of development projects which involves a hierarchical framework of four key actions: Avoid, Minimize, Restore and Offset.

A description of the regulatory setting pertinent to the upstream oil and gas industry was provided, where regulatory requirements may come not only from national regulations but also regional seas, multi-lateral

[4] IOGP Environment Committee environment good practice guidance: www.iogp.org

[5] IOGP Joint Industry Program, Sound of Marine Life Program: www.soundandmarinelife.org

and international frameworks and expectations of international financing institutions. The typical roles and responsibilities of both the regulators and the oil and gas operating companies was explained, and their respective interfaces. Occasionally, some oil and gas industry standards and recommended practices go beyond the regulatory requirements in some host country regulatory jurisdictions.

Finally, some examples were shared of previous regional scientific studies being undertaken by the oil and gas industry of new areas including the Atlantic Margin Environmental Network off the north and west coast of Scotland, BioZaire in deep-water offshore of Angola, and the ongoing EU ATLAS[6] and EU iAtlantic projects. Examples of collaborative innovation and technology initiatives to accelerate the pace of environmental improvement in the oil and gas industry were also shared, including Canada's Oil Sands Innovation Alliance (COSIA[7]), the Oil and Gas Climate Initiative (OGCI[8]) and IOGP JIPs.

9. Case studies: International Finance Corporation and its environmental management requirements

Presenter: Kevin Murphy, ERM

International lending organizations such as the World Bank and the International Finance Corporation (IFC) apply a comprehensive set of environmental and social performance standards to projects they finance. The standards are aimed at achieving environmental and social sustainability and include one that addresses biodiversity: Performance Standard (PS) 6 on Biodiversity Conservation and Sustainable Management of Living Resources. PS6 sets out the concept of 'Critical Habitat': an area of high biodiversity value (which is not necessarily restricted to protected areas) which may be particularly sensitive to human activity and would require attention to management.

Critical habitat may or may not be present within formally protected areas. Critical habitat is defined based on several widely accepted ecological criteria that make up its inherent characteristics and are independent of any vulnerability to a particular human action. Projects are not excluded from critical habitat if they can demonstrate they will have no significant adverse effects on its overall integrity, including consideration of offsets and net gain. It is noted that most experience to date in applying critical habitat approaches, especially offsets and net gain, are in the terrestrial and near coast environments. International lenders have strong procedures for monitoring and enforcement, including independent inspection and the involvement of an ombudsman.

10. Case studies: IMO Ballast water and London Convention/London Protocol waste management regulations

Presenter: Chris Vivian, Cefas, Member of GESAMP

Ballast water discharges have led to the introduction of invasive species with significant ecological, economic and human health impacts in many cases. The problem of invasive species in vessel ballast water has been increasing over time, and this is set to continue with increasing global trade utilizing vessels. IMO has led the international effort to address the problem of the transport of invasive aquatic species through shipping, initially developing guidelines and then adopting a Convention on Ballast Water Management in 2004. The IMO has developed 14 guidelines to assist with implementation of the Convention. The Convention itself features several requirements, including: all ships to implement a ballast water management plan; all ships must carry a ballast water record book; all ships required to

[6] A transatlantic assessment and deep-water ecosystem-based spatial management plan for Europe (EU ATLAS): https://www.eu-atlas.org

[7] Canada's Oil Sands Innovation Alliance (COSIA): www.cosia.ca

[8] Oil and Gas Climate Initiative (OGCI): www.oilandgasclimateinitiative.com

carry out ballast water management procedures to a given standard; ballast water management systems used to comply with the Convention must be approved by national administrations, considering relevant IMO Guidelines; and ballast water management systems which make use of Active Substances to comply with the Convention, must be approved by IMO in accordance with a specific procedure.

The London Convention 1972 was one of the first global environmental conventions and has been in force since 1975. Its objective is to promote the effective control of all sources of marine pollution and to take all practicable steps to prevent pollution of the sea by dumping of wastes and other matter. The London Protocol was agreed in 1996 to modernize the Convention and, eventually, replace it. It has the same overall objectives as the Convention. Under the Protocol, all dumping is prohibited, except for possibly acceptable wastes on the so-called 'reverse list' (Annex 1 of the Protocol). Both instruments require the use of a precautionary approach. The basic rules of the London Protocol include: particular attention shall be paid to opportunities to avoid dumping in favor of environmentally preferable alternatives; only the 8 wastes or other matter listed in Annex 1 can be considered for disposal; dumping allowed only based on a permit; wastes or other matter considered for disposal must be assessed in compliance with Annex 2 – a waste assessment framework; guidelines for each category of waste or other matter in Annex 1 provide more specific interpretation of Annex 2; and no export of wastes to other countries for dumping or incineration (Article 6) – except for carbon dioxide but not yet in force.

11. Case studies: Offshore dredging industry

Presenter: Jon Rees, Centre for Environment Fisheries and Aquaculture Science (Cefas)

A description of the complex UK regulatory landscape, and how Cefas sits within this landscape, was provided. At the international level, the OSPAR Convention and the London Convention/London Protocol are used to protect the marine environment from human activities. At the European level the EIA Directive (and other directives such as the Habitats and Birds Directives) states that projects require an assessment before consent. At the national level, the Marine and Coastal Access Act (MCAA) provide the license and monitoring requirements. Good practice guidance documents have been produced by the British Marine Aggregate Producers Association (BMAPA) and Cefas.

Different types of dredgers were described, with trailing suction hopper dredger being the most commonly used type. Approximately 19 million tonnes of aggregates (sands and gravels) are dredged in England and Wales each year and represent approximately 21% of the total national requirement for these materials, with the remainder coming from terrestrial sources. As well as aggregate extraction, navigation dredging is also controlled under the MCAA, and can be split into capital and maintenance dredging. Both capital and maintenance dredging require sediment samples to assess contaminants and a set of Action Levels (lower and upper) have been adopted requiring further assessment or non-marine end use.

The Aggregate Levy Sustainability Fund (ALSF[9]) established a significant evidence basis allowing the impacts of dredging to be understood within the Source-Pathway- Receptor framework (SPR). Five Regional Environmental Characterization Studies (RECS) allowed cumulative impacts to be determined in ways not possible at the individual license level. For example, cumulative impacts of multiple extraction sites were assessed through a regional scale modelling approach to determine the potential for waves to impact the coastline (2 % threshold). These RECS also enabled natural variability to be assessed using unimpacted control sites.

More recently the large evidence database and the ongoing monitoring program have allowed a new generation of monitoring conditions to be developed on the regional scale (Cooper et al., 2008) using new

[9] Aggregate Levy Sustainability Fund (ALSF): https://www.gov.uk/government/publications/review-of-the-aggregates-levy/review-of-the-aggregates-levy-discussion-paper#how-to-engage-with-the-review

management tools. Thus, adaptive management has been used over the last 30 years of the offshore aggregate industry, reducing the area of dredging year on year, as well as reducing impacts, whilst sustaining the industry.

Annex III

SUMMARY OF DISCUSSIONS ON SHARING EXPERIENCE AND LESSONS LEARNED IN THE APPLICATION OF RULE-BASED APPROACHES FOR ENVIRONMENTAL MANAGEMENT IN OTHER INDUSTRY SECTORS

1. Meeting participants noted the ISA's current work on developing environmental Standards and Guidelines relating to the Draft Regulations on exploitation of mineral resources, including the brief updates from the ISA workshop held in Pretoria, South Africa, in May 2019 – (i) development of a list of priorities for Standards and Guidelines; (ii) future ISA process for the development of Standards and Guidelines in a phased approach; and (iii) suggested natures of Standards (mandatory) and Guidelines (recommendatory). Further details on the outcomes of the Pretoria workshop will be included in the Pretoria workshop report, which was not available at the time of this meeting.

2. In other industries, guidelines may be recommendatory, but it is largely expected that these would be applied. For example, requiring a proponent to provide justification for where they have deviated from the guidelines facilitates the implementation of the guidelines, even when they are not mandatory.

3. Following questions from other industry representatives, the relationship between the contractor, sponsoring State and ISA (the regulator) was clarified. It was noted that the contract-based relationship between contractor and the ISA for deep-sea mining is slightly different from the license-based relationship between licensee and licensor in other industries, such as offshore aggregates.

4. Participants clarified what they envision by using the term 'rule based management approach's, e.g. providing thresholds for biodiversity objectives, or a series of actions that could be taken to preserve areas at risk of serious harm or vulnerable marine ecosystems relating to activities in the Area. Active hydrothermal vents were identified as a candidate habitat that could potentially benefit from site-specific environmental management measures that can complement APEIs.

5. Further discussion was held on the challenges of defining active and inactive vents that may occur on PMS deposits, and how any additional management measures may need to consider this challenge.

6. Meeting participants discussed how management measures can shift the burden of proof to the contractor, to 'prove' that their activities do not result in serious harm to the marine environment. Participants discussed whether a precautionary approach towards environmental management measures may require more rigid 'rules' in the first instance, until more is known on the impacts of mining in the regional context. Over time, as the regional context is better understood, these 'rules' could more closely approximate goals, where the burden of proof would shift more towards the contractor.

7. Experience from the offshore aggregates industry indicated that starting with a precautionary approach with stronger initial restrictions and monitoring requirements was common. In time, a more adaptive approach is adopted where the burden of proof is moved to the licensee. Participants discussed whether this approach could help incentivize licensees to conduct more studies to understand the regional context, if it resulted in a more adaptive (and so more flexible) approach to management.

8. Discussion was held on the IFC Performance Standards (PS), particularly PS6 relating to biodiversity, which introduces the 'critical habitat' concept. It was noted that critical habitat could occur within or outside of existing protected areas and that human activities or projects would not be excluded from critical habitat, as long as these activities were demonstrated to have no significant adverse effects. Consideration was given as to whether some measures for critical habitat included within the PS6 could be applied within a deep-sea mining context.

9. Participants discussed the management approaches used by deep-water fisheries, which was identified as a combination approach, using area-based management (for example, VME closed areas) and a rules-based approach (for example, the 'move on rule' for VME encounters). It was emphasized that VMEs are very specific to fishing activities, and that the concept of 'VMEs' would need to be re-defined in a mining context, if a similar concept were to be used as part of ISA environmental management measures. It was also mentioned that fisheries management occurs at the regional scale, including in areas within national jurisdiction, whereas deep-sea mining as regulated by the ISA will occur in the Area beyond national jurisdiction.

10. Experience from the oil and gas industry was discussed by participants, including the concept of best available techniques (BAT)[10], particularly in the case where oil and gas companies choose to adopt their internal standards in the absence of national standards where they are operating. Where national standards exist, these take precedence over internal company standards. Companies can choose to set internal standards that are more stringent, or seek better performance, than national standards. High level standards or guidelines set the framework, but it is up to the operator to demonstrate there is not an unacceptable level of risk for a specific development. The burden of proof rests with the operator.

11. Discussion also ensued on how a goals-based approach within the oil and gas industry can foster technical innovation, as operators develop novel ways to meet these requirements. An example was given on the commitment of operators on the Norwegian continental shelf to achieve zero harm from discharge of chemicals. It was noted that oil and gas operators largely work within national jurisdictions, whereas deep-sea mining will occur beyond national jurisdiction.

12. Further discussion on the oil and gas industry included the inspection mechanisms, such as permitting authorities and inspectors, and the role of Governments and Regional Seas Conventions (such as the OSPAR Convention) in regional environmental assessments. Experience from the oil and gas industry indicated the identification of regional boundaries for regional environmental assessments was a semi-regional approach, which was in part based on the areas to be licensed.

13. Participants discussed the approaches used in IMO Ballast water management. Experience from ballast water management indicated that the International Convention for the Prevention of Pollution from Ships (MARPOL) guidelines apply everywhere but that there are special areas where some activities (such as ballast water discharge) may be restricted or even prohibited.

14. Participants discussed the management approaches used within the offshore aggregates industry. Experience from the offshore aggregates industry indicated that rules relating to recovery of dredged areas were based on the time frame for recovery more than thresholds for impact. This approach resulted in the requirement to leave at least 50 cm of aggregate resource on the seafloor to facilitate recovery. It was mentioned that some sand and gravel environments can be very dynamic, with a high degree of natural disturbance, so that the impacts of dredging are not always as apparent. This is very different from the deep-sea, particularly the stable environment of the abyssal plains where nodule resources are located.

15. Further discussion about offshore aggregates management included the use of Vortex Resuspension Tanks (VORTs) to determine the sensitivity of various seabed fauna to suspended sediment concentrations[11], and the potential use of developing satellite technology for remote monitoring of plume impacts. For aggregate dredging, it was mentioned that high levels of fines in the dredged

[10] Best Available Techniques (BAT) as defined by the European Union Industrial Emissions Directive (IED): http://ec.europa.eu/environment/industry/stationary/ied/legislation.htm

[11] Last KS, Hendrick VJ, Beveridge CM & Davies AJ (2011) Measuring the effects of suspended particulate matter and smothering on the behaviour, growth and survival of key species found in areas associated with aggregate dredging. *Marine Environment Protection Fund. Report No. MEPF 08*/P76. 69pp.

aggregate could contaminate the product, so that aggregate dredging targets areas with low concentrations of fine material. Fewer fines also results in a smaller dredging plume.

16. Experience from the offshore aggregates industry indicated that employing a regional approach to managing aggregates dredging has facilitated greater understanding of cumulative impacts from multiple operators within a region. One of the purposes of the Aggregates Levy Sustainability Fund (ALSF), which used revenue generated by the Aggregates Levy, was to support strategic research into the environmental consequences of marine aggregate extraction. As a tax on primary aggregates sales, the Aggregates Levy was drawn collectively from the aggregates industry, and administered centrally by the regulator to improve knowledge and environmental management for the collective benefit of the aggregates industry.

17. Discussion was held on the relationship between ISA Regulations, Standards and Guidelines, REMPs, and other management measures. It was noted that REMPs are not legal instruments but rather instruments of environmental policy. Participants agreed that the potential for defining additional environmental management measures in the context of REMPs could build on sharing experience and lessons learned from other industries.

Annex IV

SUMMARY OF DISCUSSIONS ON APPROACHES TO ENHANCE MANAGEMENT MEASURES IN THE REGIONAL ENVIRONMENTAL MANAGEMENT PLANS BUILDING ON EXPERIENCE OF OTHER INDUSTRIES

Participants, through break-out sessions and plenary discussion under agenda item 4, identified the following key questions related to the development REMPs. These questions were used as a basis to discuss approaches to enhance management measures in REMPs, drawing on lessons learned from practices or measures in other industries.

1. **How to determine the physical and material scope of a REMP? What is a REMP aiming to address?**
    (a) How to determine the boundaries of a REMP? What are the criteria for determining such boundaries? For example, would boundaries be based on biogeographic region, location of exploration activities, or other considerations?
    (b) How would a REMP address the mandate of the ISA with respect to ensuring the effective protection of the marine environment from harmful effects that may arise from deep sea mining activities in the Area, pursuant to Article 145 of the Convention?
    (c) Should the REMP consider social, economic and cultural aspects?
    (d) How can the REMP process learn from processes within other regions? For example, how would the process of REMP developments in the MAR be transferred to other ridge systems, such as those in the Indian Ocean?
    (e) How will the REMP evolve from a 'pre-plan' document to a fully functional plan, considering that REMPs will be developed under scientific, technological and commercial uncertainty?
    (f) Could the REMP contribute to developing guidance for ecosystem or resource specific good industry practice, best available techniques and best environmental practices?
    (g) Should the REMP consider the recovery of different habitats and ecosystems impacted by mining activities, if so, how?

Examples of practices in other industries:

- In the UK aggregate industry, experts and regulators were involved to develop the initial scope for regional assessment, the baseline data and assessment methodologies to be used. Scoping exercises are then undertaken and include public consultation. By seeking endorsement by stakeholders and focusing on the most material issues for aggregates at a regional level, the scoping process helped address transparency and inclusiveness.[12]
- Offshore wind industry conducted similar scoping processes with regional environmental assessments.[13]

[12] BMAPA. Good Practice Guidance. Extraction by Dredging of Aggregates from England's Seabed. https://bmapa.org/documents/BMAPA_TCE_Good_Practice_Guidance_04.2017.pdf

[13] DECC. UK Offshore Energy Strategic Environmental Assessment. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/504874/OESEA3_Non-technical_summary.pdf

2. **What would be the vision, overarching goals and objectives of the REMP?**
    (a) How will conservation goals and objectives be defined? For example, would there be generic goals and objectives, such as those contained in the CCZ EMP, as well as specific and measurable goals and objectives, such as conserving 30 – 50% of habitats? Should the conservation objectives of a REMP be formulated along the lines of maintaining the integrity of ecosystems before and after mining?
    (b) What would be the operational objectives and measures to be included in the REMP to effectively apply the precautionary approach?
    (c) Should the REMP address multiple spatial and temporal scales? If so, how?
    (d) Would the REMP address cumulative effects of multiple mining operations, and if so, how?
    (e) Would the REMP address cumulative effects of other stressors, such as climate change, and if so, how?
    (f) Which aspects are common amongst REMPs, and which aspects are specific to mineral resources/regions?

Examples of practices in other industries:

- The UK aggregates industry has a committee on climate change to look into how climate change affects their industry.
- For offshore wind farms, one of the objectives of regional-level planning through regional environmental assessments, as a decision-making tool, is to optimize locations for wind farms within existing zones and to seek to avoid significant cumulative effects.
- Marine planning can provide a regional context to facilitate local decision making for granting marine licenses, which can also increase the confidence for applicants.

3. **How can the REMP guide individual contractors in developing environmental management systems (including Environmental Impact Statements (EISs), Environmental Management and Monitoring Plans (EMMPs), and Closure Plans)?**
    (a) What is the interrelationship between ISA Regulations, Standards and Guidelines, REMPs and Contractors' EMMPs?
    (b) When along the exploration-exploitation continuum are REMPs required?
    (c) How does the interrelationship between REMPs and EISs (and other environmental tools) work in practice? How can REMPs assist or guide contractors in conducting EIAs and EMPPs?
    (d) How could a REMP provide guidance on the design of preservation reference zones and impact reference zones, as part of environmental monitoring and impact assessment?
    (e) Would there be a cost to contractors for not preparing their EISs or EMMPs in accordance with the REMP?

Examples of practices in other industries:

- The marine aggregate sector has developed regional environmental monitoring plans, which reduce the burden on industry and the regulator, and increase the confidence in the data collected and decisions made based on these data.[14]
- Norway: all oil and gas operations take place in areas not designated as a protected area. However, industry still assesses potential impacts from operations, and there are expectations and requirements from authorities that industry assess potential harm to vulnerable natural resources as a result of industry operations.

4. **How would a regional environmental assessment and/or data report compiling physical, geological and environmental data inform the development of a REMP?**
    (a) What information could be used for the basis of the 'regional' baseline assessments?
    (b) How could a regional environmental assessment be developed to inform development and monitoring of REMPs in each region?
    (c) How can collaborations among contractors be promoted or encouraged, to support regional environmental assessments and avoid duplication of efforts?

Examples of practices in other industries:

- For aggregate dredging, one of the main objectives of regional environmental assessments was to address cumulative effects such as coastal erosion, and to pool resources in assessing effects at a regional level, which is more cost effective for future project EIAs.
- The Atlantic Frontier Environmental Network (AFEN)[15] is an example of a collaborative industry approach to regional environmental assessments. AFEN is funded by the oil industry and membership is comprised of representatives from the oil industry and regulatory bodies.

5. **Should REMPs be adaptive, and if so, how?**
    (a) How would an adaptive approach be implemented in the development and implementation of a REMP?
    (b) What would be the review process and timeline for review? Would monitoring and review lead to changes in REMPs?
    (c) Who would be responsible for reviewing REMPs?
    (d) What would be the triggers for the review process? For example, could a review be triggered by new technologies, scientific information, changes in mining activity, unexpected impacts, or other events?
    (e) How could contractors' work on environmental monitoring and assessments, including data submitted to the ISA as part of reporting, contributes to the review and implementation of the REMPs?

[14] UK Government. Regulator Assessment: Qualifying Regulatory Provisions https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/618559/BIT_assessment_-_Improvements_to_marine_licensing_-_Regional_seabed_monitoring_plan.pdf

[15] The Atlantic Frontier Environmental Network. http://www.ukooa.co.uk/issues/Afen/

(f) Could REMPs support adaptive environmental management at the contractor level, as well as the regional level?

(g) Would revision of the REMP, as part of an adaptive process, require contractors to change their EMMPs? If there is material change to a REMP as a result of a review, would contractors be required to repeat the EIA process and revise the EMMPs accordingly?

Examples of practices in other industries:

- For offshore wind, post-consent monitoring changed the license conditions. New information has resulted in changes to regional plans, which in some cases has reduced the monitoring requirements for developers, and therefore reduced the burden on the developers regarding monitoring activities.[16]
- The European Dredging Association[17] has processes/approaches for adaptive management, as does the Central Dredging Association[18].

6. How could REMPs collaborate with other existing area-based management measures, such as marine protected areas within regional seas conventions and action plans, ecologically or biologically significant marine areas (EBSAs) under the Convention on Biological Diversity (CBD), and vulnerable marine ecosystems (VMEs) closed for bottom fishing?

Examples of practices in other industries:

Many industries engage with relevant international conventions and related processes as Observers.

7. Who can engage with the development, evaluation, and review of REMPs? And how?

(a) How could REMPs maximize and incentivize collaboration and engagement with stakeholders, including scientists?

(b) Who should be involved in REMP development, and what would their involvement be?

(c) How could transparency be ensured during the development, evaluation, and review of REMPs?

(d) How could meaningful engagement in the REMP process be facilitated? How can meaningful engagement lead to informed stakeholders, including the general public?

(e) How could potential conflicts of interest be identified and managed within the REMP review process?

(f) What would be covered in the evaluation and review of a REMP?

Examples of practices in other industries:

- In the UK, with regard to aggregate extraction, government agencies such as The Centre for Environment, Fisheries and Aquaculture Science (Cefas) and Marine Management Organisation (MMO) are responsible for regional assessments.

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[16] UK Government. Review of environmental data associated with post-consent monitoring of licensing conditions of offshore windfarms https://www.gov.uk/government/publications/review-of-environmental-data-mmo-1031

[17] European Dredging Association. https://www.european-dredging.eu/

[18] CEDA. Position paper on Adaptive Management*https://dredging.org/news/news/ceda-position-paper-on-adaptive-management published/detail_news=0048_000276_000000*

- In the UK, the Aggregate Levy Sustainability Fund (ALSF), using revenue collected through the Aggregate Levy, funded marine scientific research and the Regional Environmental Characterisation Surveys (RECs) between 2007-2011. The regional environmental assessments followed the RECs and were funded through a consortia of aggregate operating companies[19].
- The International Council for the Exploration of the Sea (ICES) is an advisory body for fisheries management in the North Atlantic, collecting fisheries and other environmental information for the benefit of all users, which helps to ensure transparency.
- Oil industry in Norway: The operator shall monitor the external environment, the monitoring shall be adapted to the risk, be able to assess pollution and indicate trends in environmental condition. Monitoring is carried out by an independent consultant following established quality standards. Results from the monitoring are publicly available. National authorities develop regional integrated management plans.

8. How will data be used to support the REMP?

(a) Which data will be used, and how will it be used?

(b) Who collects the data at a regional level, and who funds this?

(c) What is the adequate level of environmental information required on which to base REMP and associated decisions, and how is this determined? Who and what determine if additional data collection is required?

(d) Who determines when data needs to be reviewed or recollected to establish new (current) baselines?

(e) Who identifies knowledge gaps and how will these be addressed? Will modeling have a role in addressing knowledge gaps, and if so, how?

(f) What is the role of scientific bodies and contractors in providing data?

(g) How can information about pelagic ecosystems be used to support REMPs?

Examples of practices in other industries:

- The Scientific & Environmental ROV Partnership using Existing Industrial Technology Project[20] is an example of collaboration between industry and science, where Remotely Operated Vehicle (ROV) 'down-time' is used to conduct scientific research.
- Industries have also funded research programs, such as the Sound and Marine Life Program supported by the oil and gas industry.
- Existing databases such as EMODnet[21] and OBIS[22], may contain information that could be used in regional environmental assessments to inform the REMP process.
- Historical data and publications could be used in Regional Environmental Assessments, alongside the collection of new data.
- Remote data collection and observatories could also contribute to the regional environmental assessment process. Examples of remote data collection and observatories include the Global

[19] BMAPA. Aggregates Levy https://bmapa.org/issues/aggregates_levy.php

[20] SERPENT Project. https://www.serpentproject.com/

[21] EMODnet http://www.emodnet.eu/

[22] OBIS https://obis.org/

Ocean Observing System [23], European Global Ocean Observing System [24], the European Multidisciplinary Seafloor and Water Column Observatory[25] and the Argo float program[26].

- Some industries collect a lot of data, but there can be issues for other users trying to access these data.
- Scientific projects can also be useful sources of data and expertise, for example, A transatlantic assessment and deep-water ecosystem-based spatial plan for Europe, Integrated Assessment of Atlantic Marine Ecosystems in Space and Time (iAtlantic), Atlantic Ocean Research Alliance Coordination and Support Action[27], Deep-sea Sponge Grounds Ecosystems of the North Atlantic, Marine Ecosystem Restoration in Changing European Seas[28] and the Global Ocean Biodiversity Initiative[29].
- Marine Aggregates Regional Environmental Assessments (MAREAs) in the UK conducted data collection as the first phase, then reviewed collected data for completeness as part of a Regional Environmental Characterization process. Additional data may then have been required, but this is often 'hole-filling' and only small amounts of additional data were needed for the regional environmental assessments. This means that when aggregate companies come to conduct their EIAs, there was usually no need for further data collection (although there will be a need for additional data collection prior to dredging for the pre-dredging baseline surveys).

9. How to measure connectivity in the region, and how can data gaps be addressed?

(a) How does connectivity differ along Mid-Ocean Ridges (MORs) and across MORs?

(b) How can connectivity be determined for vent and non-vent fauna? For example, can population genetics be a useful tool, and if so for which species?

(c) Would APEIs be designated in areas sufficiently similar to mine sites to maintain connectivity?

(d) How can an 'acceptable' distance between mine sites be determined to avoid cumulative 'harmful effects' on connectivity?

Examples of practices in other industries:

- In the UK (e.g. for dredging and offshore renewables), conservation agencies may have information on connectivity and that information would be available to industry.
- Each licensee or operator is asked to predict what they were going to do over the next 5 years, so that regional planning models can be developed to compare pristine conditions with current status, to calculate impacts at the regional scale.
- The US Bureau of Ocean Energy Management specifies minimum separation distances between certain activities and sensitive seabed features.

[23] GOOS. https://www.goosocean.org/
[24] EuroGOOS. http://eurogoos.eu/
[25] EMSO. http://www.emsodev.eu/
[26] Argo. http://www.argo.net
[27] AORA. https://www.atlanticresource.org/aora/
[28] MERCES. http://www.merces-project.eu/?q=content/wp4-restoration-deep-sea-habitats
[29] GOBI. http://gobi.org/

10. **How can 'vulnerable areas or species' be defined in the context of deep-sea mining? How can the REMP development process make sure that the location and proposed activities of contracts would not compromise the conservation objectives of the REMP**?

    (a) What terminology should be used to define 'vulnerable areas or species' in the context of ISA?

    (b) Could terms such as "rare or fragile ecosystems", "habitat of depleted, threatened or endangered species and other forms of marine life" (UNCLOS Article 194(5)) be used to describe habitats and species in need of protection?

    (c) Which criteria should be used for defining 'vulnerable areas or species'?

    (d) Could criteria for 'vulnerable areas or species' draw on experiences in applying existing criteria, such as those used for EBSAs under the CBD framework, FAO VMEs, IFC Critical Habitats, IMO Particularly Sensitive Sea Areas, MPA networks established by Regional Seas Conventions, such as the OSPAR MPA network, and national criteria for MPAs?[30]

    (e) Can the REMP include a clear process to identify APEIs and 'vulnerable areas or species"?

    (f) If APEIs along MORs are not able to achieve conservation objectives, such as maintaining connectivity, what other management measures could be applied to promote connectivity?

    (g) How could the ISA develop guidance on relinquishment, so that the relinquished areas could be used to advance conservation objectives of the REMP?

11. **How can the causes of harm be identified within REMPs, and how can levels of harm be determined?**

Examples of practices in other industries:

- In other industries, a 'harm matrix' has been developed, which considers a variety of variables, some resource and/or region specific. Examples of variables include: 1) toxic thresholds such as sub-lethal effects, acute high-level exposure, and effects of duration of exposure; 2) time for recovery and 3) severity of impact. Such an approach recognizes that while "serious harm" should be prohibited, other levels of harm could also be minimized.

12. **What are the indicators of good environmental quality (or ecosystem health) and how can they be developed for use within REMPs?**

    (a) How could collaborations among contractors be promoted to develop such indicators?

    (b) How to review the indicators in view of changing environmental baselines?

Examples of practices in other frameworks:

- The EU Marine Strategy Framework Directive aims to achieve 'Good Environmental Status' (GES) for the EU's marine waters by 2020. To help Member States interpret what GES means in practice,

[30] CBD EBSAs https://www.cbd.int/ebsa/about; FAO VME http://www.fao.org/in-action/vulnerable-marine-ecosystems/background/deep-sea-guidelines/en/; IFC Critical Habitats https://www.ifc.org/wps/wcm/connect/a359a380498007e9a1b7f3336b93d75f/GN6_November+20+2018+.pdf?MOD=AJPERES; IMO PSSA http://www.imo.org/en/OurWork/Environment/PSSAs/Pages/Default.aspx; OSPAR MPAs https://www.ospar.org/work-areas/bdc/marine-protected-areas

the Directive sets out 11 quality descriptors which describe what the environment will look like when GES has been achieved.[31]

- The OSPAR Commission has established Ecological Quality Objectives for parts of the OSPAR Convention Area, such as the North Sea. [32]

13. Should the REMP take into consideration any temporal changes in sensitivity of the environment? And if so, how?

Examples of practices in other industries:

- Temporal environmental management approaches are implemented by RFMOs for high seas fisheries, including seasonally closed areas and activity-based rules and also in the dredging industry, including restriction to protect migratory species such as Salmon.
- Seasonality, spawning and larval supply at MAR needs to be studied, and it is suggested this could be done through collaborative study with contractors.

[31] European Commission. Achieving Good Environmental Status. http://ec.europa.eu/environment/marine/good-environmental-status/index_en.htm

[32] OSPAR Commission. Ecological Quality Objectives. https://qsr2010.ospar.org/media/assessments/EcoQO/EcoQO_P01-16_complete.pdf.

Annex V

SUMMARY OF CONCLUDING DISCUSSIONS

1 The participants revisited the discussion on 'critical habitats', and whether this could be applied in a deep-sea mining context. It was considered that establishing an agreed term, process and set of criteria for defining habitats in need of protection could be beneficial to REMP development, as it may enable appropriate levels of protection to be applied to these areas. Having the ability to define habitats in need of protection early in the REMP process could help to support informed decision-making that balances resource development with protection of the marine environment.

2. Brief discussion was held on the challenges of balancing regulatory certainty with the flexibility to address regulatory requirements in a new industry where the technology and environmental impacts are largely unknown. It was mentioned that the use of a flexible approach that places the burden of proof on the contractor may not be possible where insufficient information is available to set appropriate thresholds for goals.

3. The participants also briefly discussed the application of preservation reference zones (PRZs) and impact reference zones (IRZs), within the context of developing REMPs, in particular regarding environmental monitoring and impact assessment.

4. The participants offered some final perspectives which could be considered as the ISA moves forward in REMP development:

(a) The lessons learned during REMP development for one mineral province could benefit the development of REMPs for other mineral provinces;

(b) Different mineral resources may require different environmental management measures in the context of REMPs;

(c) Looking to other marine industries could provide useful insights that may contribute to the development of environmental management measures in the context of REMPs;

(d) Future discussions on REMP development may benefit from involving additional industries, including those from wider geographical regions.

5. The final discussion touched briefly on the array of terms relating to environmental management, *e.g*. regulations, standards, guidelines, rule-based approaches, management measures, goals-based management, and process-based management, and the challenges involved in defining these terms. Participants noted that future discussions on environmental management measures may benefit from improved clarity of terms.
