

## TEMPLATE FOR COMMENTS

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<b>General Comments</b>	
<p>When preparing the general comments, stakeholders are invited to consider the following:</p> <ol style="list-style-type: none"> <li>1) The structure and layout of the draft REMP.</li> <li>2) The level of detail of the draft REMP, while avoiding being too prescriptive.</li> <li>3) The goals and objectives in the draft REMP in providing for long-term, effective protection of the marine environment in the Area of the northern Mid-Atlantic Ridge.</li> <li>4) The management measures and their ability to achieve the goals and objectives in the draft REMP.</li> </ol>	
<p>We thank the participants and organisers of the expert workshops which informed the development of this draft nMAR REMP (Szczecin, Poland in 2018, which was followed by an additional expert workshop in Évora, Portugal, in 2019 and a virtual workshop in 2020). We also note and thank intense work of the Commission, in particular the working group tasked with drafting the REMP for the Area of the northern Mid-Atlantic Ridge, who worked inter-sessionally during May 2021 and March 2022 to prepare the draft REMP document, drawing on the outcomes from these workshops. We consider this a good start to the development of the nMAR REMP, but there are many elements (many of which acknowledged in the text of the draft) which need to be added to the REMP before it can be considered complete.</p>	
<p>We note that ISBA/25/C/13 was a useful roadmap showing a preliminary strategy for the development of REMPs. We consider the development of the next roadmap for implementation of REMPs (in particular nMAR) would be useful, showing timelines for document review, workshops and development of measures noted in this nMAR REMP document listed as needing to be developed e.g. in particular thresholds.</p> <p>We consider that as part of this roadmap, a prioritization process for elements of the REMP still to be developed would be useful. We have provided an initial commentary of our considered priority in specific comments below for relevant section III 'other management measures' of the draft nMAR REMP as a starting point for further consideration/discussion.</p>	
<p>We recommend there needs to be further discussion and consideration of where all the additional information still to be added to the REMP should go. For example, if thresholds are listed 'in the REMP' as needing to be developed, should these be in this draft document, or in supplementary documents.</p>	
<p>We consider it a high priority that a network of APEIs be identified and designated to represent all habitats within the Region such as sedimentary, rocky, active vents and inactive vents etc. We</p>	

note paragraph 31 of this draft document, as read this as being a reference to other ABMTs, such as APEIs, needing to be developed through the application of network criteria and we strongly agree. We suggest such required expert discussion is prioritized.

We consider there needs to be greater clarity in the draft whose responsibility it is to fulfill each of the region-specific goals and objectives listed.

We recommend cross-referencing elements of the REMP to the goals and objectives they achieve.

A glossary of terms and abbreviations would be useful in this document.

We note the terms 'key' and 'significant' species and habitats are used frequently in this draft, but are not explained (e.g., lines 408-409). We therefore recommend a definition needs to be included in the document, and that such definitions should be developed in technical consultation with vent experts. This will particularly inform designation criteria for AMBTs (see comment below).

We appreciate that 'Scientific criteria applied for the identification and description of ABMTs in the northern Mid-Atlantic Ridge based on criteria developed by other competent international organisations' has been included in this REMP in Annex IV. However, where such criteria have already been applied to designate protected areas e.g. AINPs and SINPs, how such criteria have been used to designate these areas should be included in the REMP. Currently there is a map and coordinates of these protected areas in the draft nMAR REMP, but no list of for what reason they have been designated. We note there is such information in the Evora workshop report (Appendix 1), but suggest this should be incorporated in perhaps an annex or supporting of the draft nMAR REMP, that can be updated as new sites are identified. For example, such document could list, at a minimum, for each protected area (red text is exemplar only):

**Name of protected area:** Vent field X

**Coordinates of protected area:**

**Type of protected area:** AINP

**Criteria used to designate protected area:** Uniqueness or rarity: Area contains either (i) unique ("the only one of its kind"), rare (occurs only in few locations) or endemic species, populations or communities, and/or (ii) unique, rare or distinct, habitats or ecosystems; and/or (iii) unique or unusual geomorphological or oceanographic features.

**Description of area to justify above designation:** habitat x found at vent field x contains high abundances of highly endemic species (species A and B) which are...

Further information on how such criteria should be standardly applied will also need to be developed.

Related to the comment above, in general, we feel that any information referred to in this draft nMAR REMP document from other workshop reports should be included in this document and not direct the reader to the workshop report or other documents.

There is currently no information on the proportionality of the total area of each ABMT type (AINPs, SINPs and S/A Precaution) in relation to the total area to be exploited for mineral deposits.

Without this information it is difficult to establish whether the identified ABMT types are in proportion to the area to be exploited.

**Specific Comments**

Page	Line	Comment
		Geographic scope of the REMP
7	Figure 1	The figure, particularly the wording, is blurry. A high resolution figure should be used in the final REMP document. Ideally all figures should be full page due to the small scale nature of the features displayed.
		Environmental and Geological setting and the exploration areas
8	176	Suggest to add a sentence after last sentence of para: Many of the benthic habitats actually constitute Vulnerable Marine Ecosystems (VMEs) habitats and/or contain VME indicator species.
8	187-188	Suggest text addition: Several active <b>and inactive</b> vent systems are present within existing contract areas for exploration.  Reference to inactive hydrothermal vent system required since these habitats and ecosystems also need to be represented in the protected areas.
9	192-193	Suggested rewording for clarity: 'At the end of the relinquishment process, the exploration area <b>per contractor</b> shall not exceed 2,500 km2.'
9	209	Suggest addition of: 'Prevent habitat <b>damage and</b> loss to maintain ecosystem viability'.
9	201-204	Suggest rephrasing of sentence for clarity and addition of temporal aspect:  Due to the large difference in surface extent of the different mineral deposits it is likely that potential environmental impacts from exploiting such deposits will be on very different spatial and possibly also temporal scales. This should be taken into consideration in regional environmental planning and management.'
		A. Operational objectives for the area covered under this REMP
9	218-219	It is not clear from Para 27 at which stage the different objectives should be in place and who is responsible for them. This needs to be clarified as part of this REMP.  We suggest the following to start further consideration/discussion: The following objectives at least should be prioritized and achieved prior to a PoW for exploitation being approved: a), b), c), f), g), h), i).

9	224-225	<p>This point states that one objective is to "c) Identify and designate, where appropriate, Areas and Sites in Need of Protection and establish processes for the identification and designation of such sites"</p> <p>We note internal cross-referencing elements of the draft nMAR REMP document to the goals and objectives they help achieve would be useful to map how they are being achieved. For example, later parts of the draft contain specific criteria for AINP and SINPs designation, and also obligations on contractors, both of which go some way to explain how this objective is to be achieved.</p>
9	226	<p>This point states that one objective is to "d) Monitor and assess impacts from activities in the Area". It is unclear in this draft how this will be achieved, and how frequently this monitoring will be carried out. For example, will there be a report published on the assessments, who is responsible for monitoring and assessing impacts in the nMAR REMP and if so, how frequently? We also note there is no hypothesis driving the need for this monitoring, for example, will it inform other/further management measures? If so, this objective should be mapped and cross-referenced in sections on relevant measures/activities in this nMAR REMP document which inform monitoring, including any new management measures added to the REMP.</p>
9	226	<p>d) Monitor and assess impacts from activities in the Area;</p> <p>We note that to achieve this objective, it will be required to monitor and assess impact from activities in the Area including protected areas during and following cessation of extractive activities.</p>
10	230	<p>"f) Identify and map corridors of migratory species such as marine mammals and turtles"</p> <p>suggest: 'Identify and map corridors of migratory species such as marine mammals, <del>and</del> turtles <del>and</del> seabirds'.</p> <p>Background: Given the potential for significantly increased activity in the region, there is the potential for artificial light from vessels to increase the threat to several species from bird strike fatalities as a result of attraction to this artificial light. Shearwaters and petrels in particular are known to be particularly vulnerable to attraction to artificial light (Reed et al, 1985, Black 2005). There are five species of shearwater considered under the specific conservation objectives of the OSPAR NACES MPA site, and five species of petrel. Given the proximity of the NACES MPA to the northern Mid-Atlantic Ridge, similarities in species are expected between NACES MPA and nMAR REMP, and therefore consideration should be</p>

		<p>given the seabirds under a number of the “Region-specific goals and objectives” (Lines 206-246).</p> <p>In particular, Section I, 26. g) Ensure exploitation does not exceed cumulative impacts thresholds – e.g. For bird strike fatalities, disturbance or displacement from foraging habitat.</p> <p>Under Section II A – Operational objectives for the area covered under this REMP – all items a) - l) should be considered against potentially vulnerable seabirds species using the region.</p>
10	231-232	<p>Seabirds should also be mentioned (impact of light from vessels can lead to increased bird strikes – see above background). Thus suggest</p> <p>g): Identify and map feeding and breeding grounds for key species such as marine mammals, large nekton <b>and seabirds.</b></p>
10	237-239	<p>We suggest a redraft of this objective to make it clearer what it is trying to achieve before we can fully consider.</p>
10	240	<p>"a) Establish a process for periodically updating environmental baseline data for the region"</p> <p>Suggest rewording to: Establish a process for periodically assessing <del>updating</del> <b>changes from the</b> environmental baseline data for the region.'</p> <p>There is only one baseline data set, i.e., the set taken at time Zero against which all future changes are assessed.</p>
10	244-246	<p>This point states that one objective is to "l) Encourage the development of mining technologies that can help effectively address the potential environmental risks to the MAR systems, that may be posed by exploitation of polymetallic sulphides". Information will need to be added to this draft REMP to explain how this will be achieved.</p>
		B. Operational objectives for contract areas
10	248-250	<p>There appears to be a contradiction between lines 248 and 249/50 in terms of whether these objectives are restricted to contract areas and/or regional – this should be made clear in this title of the section. Clarification is also needed in this draft regarding whether the ‘regional scale’ is the same as the geographic REMP area.</p>
10	249-250	<p>This line states "The following operational objectives are related to contract areas as well as the regional scale" however it is unclear how the points will be scaled up to regional scale. If this is in part achieved by lines 270-271, then a cross-reference from this section would be useful to show how such an objective will be achieved.</p>
		Overall considerations

11	276-281	We agree regarding adaptiveness of thresholds, but related to our general comments, we need to understand when thresholds will be proposed.
		Sites in need of protection (SINPs)
12	320-337	We consider this a good approach, noting final checks of whether the delineation is in line with the generic guidance developed by the LTC on the zoning scheme (TBC) should be reviewed by the LTC. An additional bullet noting this may be required in paragraph 40.
12	343-345	Suggested rewording: Encouraging the scientific community to report any newly discovered vulnerable or sensitive ecosystem to the ISA secretariat for review by the LTC.
12	346-347	Suggest rewording to: The LTC will consider if further discussion or appropriate actions would be needed at their next meeting, and will provide their recommendation <b>within 6 months of this meeting, subject to having received the information at least 30 days in advance of such meeting.</b>
		Site/Areas in Need of Precaution (S/A Precaution)
12/13	356-359	Suggest rewording to: When scientific information from further research and direct observation becomes available, ISA, through its relevant process (e.g., LTC supported by expert workshops), <b>will</b> assess if the sites/areas can be described as sites/areas in need of protection <b>within 6 months of receiving the information</b> and inform future review of the REMP
13	374-375	Ways to apply the precautionary principle should be detailed e.g. stopping activities in/potentially impacting areas under assessment until their status is assessed.
	383-384	Other management measures: A. At the scale of the area covered under this REMP
		It is unclear what the line "a) Apply a range of mitigation measures, as appropriate, to all major impacts from exploitation activities;" means and to whom.  For example, the Contractor shall apply a range of mitigation measures, as set out in their EMMP, to all major impacts from exploitation activities. A link to such requirement should be made, and if additional mitigation measures are to be applied not just by the contractor, this should be stated.
13	386	Linked to our general comments, a timeline for the development of thresholds should be developed, including prioritization of when each threshold is required to be developed by.
13	389-390	The following thresholds together with their indicators and methodology for measuring these thresholds will be developed:  Suggest rephrasing to (or other such wording to show this list is not exhaustive): The following thresholds together with their indicators and

		methodology for measuring these thresholds will be developed. <b>This list does not prevent developing further thresholds if scientific evidence recommending such thresholds becomes available.</b>
13	398	<ul style="list-style-type: none"> <li>• acceptable levels of light pollution in the pelagic and benthic environment</li> </ul> <p>suggest rewording to align with noise bullet above:</p> <ul style="list-style-type: none"> <li>• acceptable levels of light pollution <b>from vessels and</b> in the pelagic and benthic environment;</li> </ul>
		Other management measures: B. at the scale of contract areas
14	405-409	b) and c) both need to make reference to EMMP document
14	410-411	Such 'key' representative sediment/rocky communities should be predetermined by the ISA and contractors can add to such a list should they identify additional 'key sediment systems'. Such key sediments systems will need to be represented in APEIs when developed.
14	415-417	<p>Thresholds should be defined by the LTC with advice from appropriated qualified experts, based on best-available evidence and updated in light of knew knowledge over time.</p> <p>Suggested addition: To control exploitation activity to remain within impact thresholds, contractors should apply the established thresholds and where relevant identify relevant environmental thresholds to be defined by the LTC, e.g. for impact of particulates in plumes;</p>
14	424-425	<p>g) Apply thresholds for the impacts of mining plume (particles and toxic contaminants) on SINPs;</p> <p>suggest text addition: Apply thresholds for the impacts of mining plume (<b>e.g., for particles and toxic contaminants</b>) on SINPs;</p>
14	426-427	Overburden removal needs to be defined, and incorporated into suggested glossary in General Comments.
14	437-438	<p>Suggest: Avoid the introduction of invasive species from vessels <b>and production infrastructure</b> that can lead to loss of ecosystem function and biodiversity;</p>
	447	Categorization of faunal communities should be the same regionally, so should either be included in both para 48 and 49, or just 48. This needs further consideration.
15	464-472	A standardised approach <b>should</b> be established...'
		Implementation strategy I. Monitoring at the regional scale and research to enhance a comprehensive understanding of regional environmental baseline, and spatial and temporal variations
15	469-472	e) Migratory connectivity of marine mammals, sea turtles, or other large animals in the surface and midwater environments...

		<p>Suggest rewording to:  Migratory connectivity of seabirds, marine mammals, sea turtles or other large animals,...</p> <p>Seabirds, for whom the area is an important feeding ground, might be impacted if surface biomass is reduced due to mining impacts. Some whales can dive deeper than midwater region.</p>
		I. Monitoring and research to support non-spatial management
16	514	<p>It is important to note that we need to identify the thresholds that warn us in time that we are approaching tipping-point, as opposed to just 'identification of tipping-points'. We should have a tiered threshold system in place to avoid ever getting to the tipping point:</p> <p>first tier: a threshold that indicates our operation are at a safe level and within the boundaries of effective environmental protection.</p> <p>second tier: a warning that we have reached critical levels. This should trigger management measures (possibly emergency orders)</p> <p>third tier: serious harm has been done; emergency management measures come automatically in place (operations have to be ceased instantly and possible liability may follow).</p>
18	Annex 1 577	It would be beneficial to have zoomed in maps so that contactor areas can be viewed alongside all protected areas.

**Section III preliminary priority assessment of other management measures to be developed:**

*NB: The draft nMAR REMP states there are many measures still to be developed. We have undertaken a preliminary prioritisation exercise of the management measures in Section III. Priority reflects which measures need to be developed first, and which could follow after. It focuses on those measures which are for the Authority to establish. Those which the REMP seems to note are for the Contractor to establish will already have clear timing requirements associated with the draft Exploitation Regulations.*

*We further note that our comment on requiring a network of APEI's in General Comments is considered 'high priority'.*

A. At the same of the area covered under this REMP	48 (a)	Apply a range of mitigation measures, as appropriate, to all major impacts from exploitation activities	High priority	Given the mitigation measures will be applied at the regional level, we recommend these are drafted as high priority to inform the rest of the REM development.
	48 (b)	Monitoring for potential cumulative impacts in the Area to prevent serious harm	Medium priority	
	48(c)	Develop multiple thresholds, which can enable timely detection of where impacts are approaching serious harm. Determining the thresholds for what would be considered "serious harm" can draw on existing frameworks and strategies and benefit from engaging with appropriate experts. The following thresholds together with their indicators and methodology for measuring these thresholds will be developed	See individual variables below	
	48(c)	acceptable levels of potentially toxic contaminants and particulates impacting on biota in the SINPs and AINPs listed in Annex I and II;	High priority	Given the potential for increased contaminants being released during mining activity, this threshold should be prioritised
	48(c)	acceptable levels of potentially toxic contaminants in returned water	High priority	Given the potential for increased contaminants being released during mining activity, this threshold should be prioritised
	48(c)	acceptable levels of particulate content of returned water	High priority	Given the potential for increased contaminants being released during mining activity, this threshold should be prioritised

	48(c)	acceptable levels of noise from vessel and any noise emitted in the water column and benthic environment	Medium priority	Whilst important, this could take time to establish so consider these thresholds are developed over a longer period of time. However, these thresholds should be in place before exploitation activities commence.
	48(c)	acceptable deviation from baseline information on habitats before an action is taken	High priority	This is required before exploitation activity.
	48(c)	acceptable levels of light pollution in the pelagic and benthic environment	Medium priority	Whilst important, this could take time to establish so consider these thresholds are developed over a longer period of time. However, these Propose the thresholds should be in place before exploitation activities commence.
B At the scale of contract areas	49 (a)	On active vent sites with significant megafauna communities, contractors should ensure active mining plume management as well as monitoring of hydrothermal flows to avoid interruption or disruption to hydrothermal flows upon which vent communities rely	Contractor	However, general guidance on potential mitigation measures could be provided in the REMP for consistency.
	49 (b)	On vulnerable habitats including coral gardens, sponge aggregations, contractors will monitor any of such habitats likely to be impacted by their activities, including the habitats that lie in the vicinity outside their contract areas	Contractor	However, general guidance on potential monitoring measures could be provided in the REMP for consistency.
	49 (c)	On key vulnerable/sensitive species, contractors will monitor significant communities of fauna within contract areas and in surrounding areas likely to be impacted by mining activities	Contractor	However, general guidance on potential monitoring measures could be provided in the REMP for consistency.

49 (d)	To manage harmful environmental impacts to key sediment systems, contractors will need to identify key sediment communities both within and in the areas surrounding a contract area and actively manage the return-water plumes and the impact of the removal of any sediment overlying the mineral resources (over burden) and its deposition to avoid serious harm to the marine environment.	Contractor	
49 (e)	To control exploitation activity to remain within impact thresholds, contractors should apply the established thresholds and where relevant identify relevant environmental thresholds, e.g. for impact of particulates in plume	Contractor	Requires thresholds to be established which are high priority (see individual comments above for rows 5-10)
49 (f)	To ensure no increase in ambient particulate flux in the pelagic environment, contractors should control the generation of plumes arising from extraction and redeposition of waste material from surface processes such that they remain at or below ambient levels. The release of returned water plume (particles, contaminants, and altered water chemistry) should be returned as close to the sea floor as practical, noting that release in midwater can disrupt larval dispersal	Contractor	
49 (g)	Apply thresholds for the impacts of mining plume (particles and toxic contaminants) on SINPs	Contractor	Requires thresholds to be established which are high priority (see individual comments above for rows 5-10)
49 (h)	Prevent the impact of overburden removal and placement on hydrothermal vent faunas and fauna of other SINPs	Contractor	
49 (i)	Apply an adaptive management approach in undertaking activities in their contract area	Contractor	Adaptive management is case specific so no action required at this stage.

49 (j)	Control generation of underwater sound from surface vessel, from riser pipe pumps, particularly in the Sound Fixing and Ranging (SOFAR) channel and at the seabed to avoid interference with pelagic fauna communications, particularly marine mammals	Contractor	
49 (k)	Control light on the seabed and from vessels that can attract birds and disrupt their behaviour	Contractor	
49 (l)	Apply thresholds for noise at seabed and in riser pipe pumps and for light pollution at seabed and on the surface, recognizing that such thresholds may need to be periodically reviewed as more information becomes available on environmental baselines and biological responses to pressures	High priority	Requires thresholds to be established which are high priority (see individual comments above for rows 5-10)
49 (m)	Avoid the introduction of invasive species from vessels that can lead to loss of ecosystem function and biodiversity	Contractor	
49 (n)	Monitor direct and indirect impacts of mining, including impacts on subsurface hydrological flow changes, impacts of overburden removal and on key habitats outside contract areas, and potential long-term impacts on biological communities, in order to minimize such impacts	Contractor	
49 (o)	Undertake seabed surveys and habitat mapping of the area predicted to be impacted by the mining plume	Contractor	
49 (p)	Apply temporal suspension of mining operations during significant biological events (e.g., major spawning aggregations)	Medium priority	Whilst this is placed on the contractor, we recommend general guidance about sensitive timings be drafted.
49 (q)	Develop thresholds for categorization of significant faunal communities	High priority	Requires thresholds to be established which are high priority (see individual comments above for rows 5-10)

Implementation Strategy	50. I.	Monitoring at the regional scale and research to enhance a comprehensive understanding of regional environmental baseline, and spatial and temporal variations	Medium priority	Should be in place before the first exploitation contract is awarded
	50 (a)	Bathymetry, geophysics and regional scale mapping: Efforts may start from collating data and information from different sources, including the ISA DeepData database, to develop regional-scale knowledge of bathymetry and geophysics, in order to provide a regional baseline and to guide future sampling efforts	Medium priority	Should be in place before the first exploitation contract is awarded
	50 (b)	Physical and chemical oceanography: Oceanographic models can be developed at the regional scale through collaboration. Contractors are encouraged to enhance sampling efforts and collaborate with each other and with scientific communities to establish regional patterns of ocean chemistry, currents and other oceanographic parameters.	Medium priority	Should be in place before the first exploitation contract is awarded
	50 (c)	Regional patterns of biodiversity: A practical first step may be to focus on basic matrices, such as species abundance and composition of different taxa and the diversity, richness, evenness of assemblages.	Medium priority	Should be in place before the first exploitation contract is awarded
	50 (d)	Population connectivity: Initial monitoring and research efforts may focus on validating existing connectivity models. A standardized approach can be established using suitable indicator species for regional analyses of connectivity to provide regional baselines against which changes can be monitored	Medium priority	Should be in place before the first exploitation contract is awarded
	50 (a)	Migratory connectivity of marine mammals, sea turtles, or other large animals in the surface and midwater environments: Monitoring and research may focus on mapping regional baselines, key habitats that serve as feeding and breeding grounds, as well as potential impacts from underwater noise or plumes during exploitation activities on the suitability of migration corridors.	Medium priority	Should be in place before the first exploitation contract is awarded
	50 (f)	Trophic connectivity/relationships: Monitoring and research may focus on measurements at different trophic levels, such as surface primary productivity, the location of the deep-scattering layer and diel vertical migrations in the mid-water column, and abundance of top predators.	Medium priority	Should be in place before the first exploitation contract is awarded

50 (g)	<p>Ecosystem function: Research efforts may focus on structural properties critical for ecosystem function. Studies on community structure may be an essential first step in understanding ecosystem function, which can be followed by experimental studies on “tipping points” beyond which further loss on structural properties may impact on ecosystem function. Identifying functional trait profiles can also be a useful approach for understanding ecosystem function. Information on trait profiles will need to be augmented by information on trophic flows, functional diversity, and redundancy of traits at the major trophic levels. Models of ecosystem function and identification of proxies or indicator species should be undertaken for monitoring ecosystem function.</p>	Medium priority	Should be in place before the first exploitation contract is awarded
50 (h)	<p>Resilience and recovery: Monitoring and research may focus on the abundance or health of indicator species and community trait profiles, in particular biological traits linked to sensitivity. Small-scale disturbances or experiments can also inform models and predictions of resilience and recovery</p>	Medium priority	Should be in place before the first exploitation contract is awarded
II	<p>Monitoring and research to support area-based management</p>		
a)	<p>Habitat mapping and modelling: Habitats will first need to be comprehensively defined and mapped within the region to establish environmental baselines and assess habitat quality, quantity and regional distribution. Habitat models may be developed for the identification of representative habitats.</p>	Medium priority	Likely to be informed by contract applications. Should be in place before the first exploitation contract is awarded
b)	<p>Buffers and depth zonation: Experimental studies and research may be conducted to address important data gaps for designing buffer zones, such as data on hydrodynamic patterns and geophysical characteristic of vents fields, which are necessary for understanding the footprint around which to design buffer zones.</p>	High priority	As buffer zones will be important as mitigation and protecting the marine environment, we recommend this is prioritised to understand effectiveness of such measures

c)	Better knowledge of AINPs and S/A-Precaution: As such areas may be located outside contract areas and cover large geographical space, contractors are encouraged to collaborate with scientific organizations to conduct joint surveys. Where possible, the ISA secretariat may facilitate collaboration with other organisations and multinational research projects in developing multidisciplinary programmes for monitoring and research.	High priority	As protected areas will be important for protecting the marine environment, we recommend this is prioritised to understand effectiveness of such measures
III	Monitoring and research to support non-spatial management		
a)	Risk analyses at the regional scale: This can be achieved through the development and application of frameworks and methodologies, such as cumulative impact analyses and scenario planning, to identify and assess risks to ecosystems, habitats, communities and species and to establish key thresholds which trigger management actions.	High priority	Approach to be prioritised. Thresholds linked to rows 5-10
b)	Physical and chemical characterization of natural hydrothermal plumes, as well as plumes from exploitation activities. Changes in hydrothermal fluid which may be associated with exploitation activities should also be monitored. Monitoring may focus on the composition of natural and mining-induced plumes and ecotoxicology, plume dispersal models, and the identification of tipping-points to inform monitoring efforts and associated management actions. A combination of different methodologies (field experiments and models) may be used to understand the behaviour of plumes and inform the development of relevant thresholds. Contractors will be encouraged to develop technological solutions for plume reduction.	Medium priority	Likely to be informed by contract applications. Should be in place before the first exploitation contract is awarded
c)	Underwater noise: Hydrophones can be used for passive acoustic monitoring of background noises. The activities and behaviour of fishes and marine mammals should also be monitored to understand the impacts of noises, and to inform the development of relevant thresholds.	Medium priority	Likely to be informed by contract applications. Should be in place before the first exploitation contract is awarded
d)	Development of other thresholds: Thresholds should be identified through a phased approach, in collaboration with contractors, scientific communities and other relevant international bodies.	Medium/high	

