



# Conserving the common heritage of humankind – Options for the deep-seabed mining regime<sup>☆</sup>



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## ABSTRACT

The seabed in areas beyond national jurisdiction is the common heritage of mankind (CHM), as declared in the 1982 United Nations Convention on the Law of the Sea. The CHM principle requires not only the sharing of benefits (the subject of a parallel article by the authors) but also the conservation and preservation of natural and biological resources for both present and future generations. The International Seabed Authority, tasked with operationalising the CHM principle in the context of deep-seabed mining, has not yet defined which measures it will take to give effect to environmental aspects of the CHM principle. This article seeks to contribute to the discussion about the operationalization of the CHM principle by specifically examining the environmental dimension of the CHM principle. To this end, the article interprets the CHM principle in the context of sustainable development and discusses a number of potential options the Authority could consider to support the application of the CHM principle. These include: funding scientific research to increase knowledge about the deep ocean for humankind; ensuring public participation in the decision-making process; debating the need for and alternatives to deep-seabed mining; determining conservation targets and levels of harm deemed acceptable; limiting environmental impacts; preserving mineable sites for future generations; compensating humankind for environmental harm; and ensuring enforcement.

## 1. Introduction

Article 136 of the United Nations Convention on the Law of the Sea (LOSC or Convention),<sup>1</sup> declares the international seabed ‘Area’ and its resources to be the ‘common heritage of mankind’ (CHM). This legal status and principle is of fundamental importance to the regime that was developed to manage mineral mining in the Area, and article 311(6) of the Convention prohibits any derogation from it.

The general aim of incorporating the CHM principle in the Convention was to declare the Area to be outside the realm of state sovereignty and to infuse the regime with inter-generational and intra-generational equity with regard to managing, preserving, and benefiting from the Area and its natural resources [1,2]. As a result, the principle is generally understood to require access and benefit-sharing arrangements, especially for developing States. However, as South Africa highlighted in the UN General Assembly on 4 December 2009:

‘[T]he common heritage of mankind principle is not solely about

benefit sharing. [It] is just as much about conservation and preservation. The principle is about solidarity; solidarity in the preservation and conservation of a good we all share and therefore should protect. But also solidarity in ensuring that this good, which we all share, is for all our benefit’ [1].

Such solidarity of purpose in giving effect to the CHM principle may prove challenging to achieve: Increasing commercial interest in seabed mining is spurring the development of international regulations to guide future exploitation of seabed minerals in the Area [3] at the same time as scientists are expressing concerns about the potential for long-term and significant harm arising from deep-seabed mining [4–7].

The International Seabed Authority (ISA) was established by the LOSC as the institution to regulate, organise, and control deep-seabed mineral mining in the Area on behalf of humankind as a whole. This means, notes Rüdiger Wolfrum, a judge on the International Tribunal for the Law of the Sea, that ‘States Parties are meant to act as a kind of trustee on behalf of mankind as a whole. It is in this respect that the

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<sup>1</sup> United Nations Convention on the Law of the Sea (adopted 10 December 1982, entered into force 16 November 1994) 1833 UNTS 3.

common heritage principle introduces a fundamental change in the legal regime governing the deep seabed' [8].

The ISA will need to discuss and decide upon the measures through which the CHM principle will be given effect. A number of contributions to this discussion have been made, which include a parallel article by the authors that discusses the benefit-sharing measures relevant to the Area regime [9]. A recent article by Bourrel, Thiele, and Currie argues for a participatory, open, and transparent decision-making process at the ISA to ensure representation of the diverse views of humankind, including from civil society, science, regional organisations and other communities [10]. Van Doorn traces the environmental roots of the CHM principle [11]. Additionally, Tladi examines CHM in the context of marine biodiversity in areas beyond national jurisdiction and highlights the strong connection of the principle with sustainable development [1]. While recognising the centrality of benefit-sharing, Tladi also stresses the importance of inter-generational equity and conservation, arguing that benefit-sharing alone is insufficient to meet the broader expectations of the CHM principle.

This article seeks to contribute to the discussion by specifically examining the environmental dimension of the CHM principle. It is generally accepted that the principle requires the conservation and preservation of natural and biological resources for both present and future generations [12,14,16]. More explicitly, the LOSC requires that '[n]ecessary measures shall be taken with respect to activities in the Area to ensure effective protection for the marine environment from harmful effects which may arise from such activities.'<sup>2</sup> Given that the ISA has not yet defined which measures will be taken to give effect to environmental aspects of the CHM principle, this article focusses on a number of potential options in section three. Prior to this discussion, section two offers a brief definition of the principle and puts it in the context of sustainable development.

## 2. The common heritage of humankind principle in context

### 2.1. Elements of the common heritage of humankind principle

The principle of common heritage of humankind was controversial during the negotiations of the LOSC, as amply detailed in the literature [2,12,13]. Nonetheless, it was incorporated into the Convention as 'an essential element—even the basis of Part XI' [8], which sets out the Area regime.

Although the Convention does not provide a definition of the CHM principle, its broad scope is arguably reflected in several key provisions of Part XI as shown in (Table 1).

As this table suggests, the Convention requires 'effective protection' from 'harmful effects' of seabed mining. Both of these terms have yet to be defined in the context of seabed mining, although the LOSC, the 1994 Implementing Agreement<sup>3</sup> and the ISA's Mining Code<sup>4</sup> have elaborated on the consequences of 'serious harm.' If mining activities pose risks of serious harm, the ISA has the power to: (i) set-aside areas where mining will not be permitted, (ii) deny a new application for a contract to conduct seabed mineral activities; (iii) suspend or adjust operations, and (iv) hold the contractor and its sponsoring state liable for environmental harm if it ensues [4].<sup>5</sup> Such a context arguably

provides the minimum environmental parameters for safeguarding the common heritage of mankind.

As the table also demonstrates, the CHM principle entails, *inter alia*, the sharing of the benefits of deep-seabed mining as well as the preservation of the natural resources and the marine environment. In his detailed study of the principle, Baslar summarises the relationship of these two aims: 'As benefits derived from the exploitation of the seabed should be distributed with special consideration for developing countries, so the burden of protecting the environment should also be shared' [2]. Kiss, similar to others [12,14,15], describes the CHM principle as being about the 'optimum use of resources in a spirit of conservation for future generations' [16], while Tladi observes the following:

'It reminds us not only that we have the right to enjoy the riches of our earth and, in the context of the ocean, the richness of the ocean and the ocean floor but also that we have responsibilities to ensure that we conserve and protect these riches, both for the enjoyment of the current generation and for generations yet to come' [1].

The interplay of these aims, sharing the resources and ensuring their conservation for future generations, puts the CHM principle in the broader context of sustainable development.

### 2.2. Inter-generational considerations and sustainable development

Implicit in the term 'heritage', the CHM principle requires consideration of inter-generational equity such that any benefits of deep-sea resources are shared, and the resources in their natural environment are, at least in part, preserved for generations to come. In his recollection of the negotiations of the LOSC, Pinto confirms that inter-generational considerations and the preservation of the environment were important elements of the CHM principle from the outset:

'It was a concept that could embody the common values and aspirations of all human beings, and could, moreover, serve to unite the values and aspirations of the present generation with those of future generations. When dealing with non-renewable resources, and the preservation of the environment, which the Convention set out to do, such a concept could be an important reference point and was, in fact, used as such' [17].

This combination of exploitation and long-term preservation links the CHM principle to the concept of *sustainable development* (which came into general parlance shortly after the LOSC was negotiated) [18]. As Wolfrum notes: 'An important part of the intertemporal dimension of the common heritage principle is the concept of sustainable development' [8]. Sustainable development captures the struggle of, and requires the balance between, *inter alia*, the interests of present and future generations as well as the aims of supporting the advancement of developing States and ensuring the integrity of the Earth's systems. In relation to mineral resources, this balance is elaborated on in the 1987 Brundtland Report to the UN:

'As for non-renewable resources, like fossil fuels and minerals, their use reduces the stock available for future generations. But this does not mean that such resources should not be used. In general the rate of depletion should take into account the criticality of that resource, the availability of technologies for minimizing depletion, and the likelihood of substitutes being available. Thus land should not be degraded beyond reasonable recovery. With minerals and fossil fuels, the rate of depletion and the emphasis on recycling and

<sup>2</sup> LOSC, Article 145 (emphasis added).

<sup>3</sup> *Agreement Relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982* (adopted by UNGA Resolution 48/263, New York, 28 July 1994, in force since 16 November 1994) 1836 UNTS 3.

<sup>4</sup> 'Mining Code' is an umbrella term for the ISA's regulations and recommendations that set out the detailed rules, regulations, and procedures for seabed mining in the Area. See <https://www.isa.org/jm/mining-code>.

<sup>5</sup> LOSC, Articles 139, 162(2)(w) and (x), 165(2)(k) and (l); See also LOSC, annex III Article 18; Regulations on Prospecting and Exploration for Polymetallic Nodules in the Area, ISBA/19/C/17 (22 July 2013) (*Nodules Exploration Regulations*), regulation 21; Regulations on Prospecting and Exploration for Polymetallic Sulphides in the Area,

(footnote continued)

ISBA/16/A/12/Rev.1 (15 November 2010) (*Sulphides Exploration Regulations*), regulation 23; Regulations on Prospecting and Exploration for Cobalt-rich Ferromanganese Crusts in the Area, ISBA/18/A/11 (27 July 2012) (*Crusts Exploration Regulations*), regulation 23.

**Table 1**  
Provisions of Part XI of the LOSC relevant to the principle of common heritage of humankind.

Element	Explanation	Source
Non-appropriation	All rights in the resources of the Area are vested in mankind as a whole and no State can claim sovereignty or sovereign rights over the Area and its resources.	Art. 137
Common management & regulation	All seabed mining activities in the Area are organised and controlled by the ISA on behalf of mankind as a whole. The rules, regulations and procedures adopted by the ISA are binding on all member States, regardless of individual consent.	Arts. 137(2), 153(1), 156–185
Peaceful purposes	The Area is open to use exclusively for peaceful purposes by all States.	Art. 141
Environmental protection	The ISA is required to ensure effective protection of the marine environment from harmful effects of seabed mining; prevent, reduce, and control pollution; protect and conserve the natural resources of the Area; and prevent damage to the flora and fauna of the marine environment.	Art. 145
Benefit-sharing	Activities in the Area must be carried out for the benefit of mankind as a whole, taking into particular consideration the interests of developing States. The ISA is to provide for equitable sharing of financial and other economic benefits derived from activities in the Area. Other distributive mechanisms include equal participation of all States, transfer of technology (to enable equal participation), preferential treatment of developing States, and protection against adverse effects of deep-seabed mining on land-based mining interests.	Arts. 140, 144, 148
Marine scientific research	Scientific research in the Area is to be carried out exclusively for the benefit of mankind as a whole. The ISA and its member States must support the research capacity of developing States, support the transfer of technology and scientific information relating to seabed mining, and provide for the effective participation of developing States in the seabed mining regime.	Arts. 143, 144, 148; 1994 Implementing Agreement, annex section 5
State responsibility	States parties must ensure that activities in the Area are carried out in conformity with the international regulatory framework. Damage caused by failure to comply with these responsibilities entails liability.	Art. 139

economy of use should be calibrated to ensure that the resource does not run out before acceptable substitutes are available. Sustainable development requires that the rate of depletion of non-renewable resources should foreclose as few future options as possible' [18].

The report also stresses the need for development to not endanger the life-support systems:

'[...] Today's interventions [in natural systems, such as through mineral mining] are more drastic in scale and impact, and more threatening to life-support systems both locally and globally. This need not happen. At a minimum, sustainable development must not endanger the natural systems that support life on Earth: the atmosphere, the waters, the soils, and the living beings' [18].

Striking a balance among the economic, social, and environmental dimensions of sustainable development is already recognised to be notoriously difficult, and adding to that the other aspects of the CHM principle can only make it more so. The Seabed Disputes Chamber provided important guidance regarding this balance in its 2011 Advisory Opinion on the 'Responsibilities and Obligations of States Sponsoring Persons and Entities with Respect to Activities in the Area',<sup>6</sup> wherein it expressly recognises the provisions in the Convention designed to ensure preferential treatment for developing States but notes that these do not affect the responsibilities or liability of sponsoring States.<sup>7</sup> The Opinion stresses the overriding importance of the marine environment as transcending economic differences between States. To allow for differential treatment regarding States' responsibilities and liability 'would jeopardize uniform application of the highest standards of protection of the marine environment, the safe development of activities in the Area and protection of the common heritage of mankind.'<sup>8</sup>

<sup>6</sup> *Responsibilities and Obligations of States Sponsoring Persons and Entities with Respect to Activities in the Area* (Seabed Disputes Chamber of the International Tribunal of the Law of the Sea, Case No 17, 1 February 2011).

<sup>7</sup> *Ibid.*, paragraph, 151–157.

<sup>8</sup> *Ibid.*, paragraph 159; See also paragraph 158. Nonetheless, the Chamber confirmed that economic differences may be relevant in applying a precautionary approach as a direct obligation under the Mining Code. The Mining Code references Principle 15 of the Rio Declaration, which in turn requires States to apply the precautionary approach 'according to their capabilities' (see *ibid.*, paragraphs 129–135).

In this finding, the Chamber articulates three aims that are presumed to be shared by States, namely ensuring: (i) that high environmental standards are upheld by all; (ii) the safety of mining operations; and (iii) that any mineral development does not undermine the common heritage of humankind. The next section discusses a range of potential responses along a temporal timeframe that could help the ISA to meet these aims.

### 3. Potential measures to give effect to the environmental protection dimension of the common heritage of humankind principle

The CHM principle, similar to the concept of sustainable development, does not dictate specific measures, but rather guides decisions regarding resource management. In interpreting the considerations that follow from the CHM principle in light of the Area regime, several measures can be identified that would give effect to the environmental protection dimension of the CHM principle. This section discusses these potential measures in broadly chronological order, as illustrated in (Fig. 1). The first four measures may be considered preliminary to the extent that they will need to be taken before mining commences. The latter four measures would guide the regulation and management of deep-seabed mining during the production stage.

#### 3.1. Funding marine scientific research to increase knowledge for humankind

The effective protection of the marine environment, including the prevention of serious environmental harm in the context of deep-seabed mining depends on the extent of scientific knowledge about the deep ocean and its ecosystems. Indeed, the sharing of knowledge concerning the common heritage of humankind is generally considered as one of the key non-material benefits for all [8].

Although the ISA has collaborated in a number of scientific projects, such as the Census of Marine Life, these were not necessarily driven by the needs of the Authority itself, no doubt partly due to a lack of funding [19]. Nevertheless, the ISA's collaboration with the Kaplan project resulted in the recommendation to establish a network of no-mining areas in the Clarion-Clipperton Zone as part of a regional scale environmental management plan. The absence of support for a strategic research agenda, however, has meant that the ISA relies on

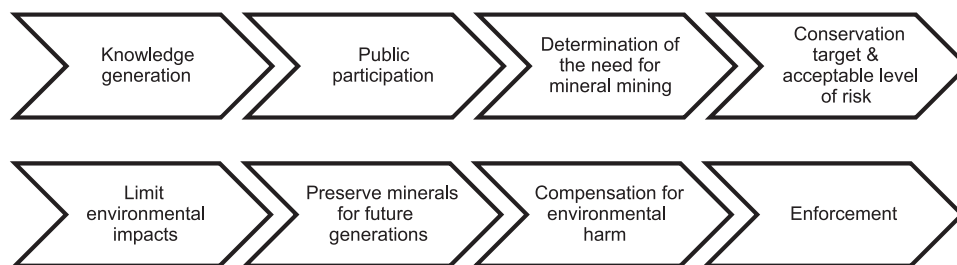


Fig. 1. Diagram of potential measures for environmental protection in the context of the principle of the common heritage of humankind.

contractors and the scientific community for research results. For some research topics, particularly concerning negative environmental impacts of deep-seabed mining, there is the potential of a conflict of interest when it is carried out by the contractors. An independent ISA research fund could ensure that scientific research is conducted at an arm's length from financial interests, could help to validate earlier findings, and to fill in some of the many knowledge gaps [20,21].

Development of a 'Seabed Sustainability Fund', was proposed in the ISA's report on a draft regulatory framework for mineral exploitation. The report notes:

'The idea and rationale of a fund is for the Authority to be in a position, based on expert recommendations, to direct further research e.g. in relation to marine ecosystems in the Area and to develop institutional capacities. At the moment the Authority/common heritage of mankind are in a 'Catch 22' with no budget for large-scale research activities' [22].

A Seabed Sustainability Fund would provide for the financing and coordination of research on the deep ocean and its ecosystems, targeted to address the range of issues relevant to future good decision-making concerning deep-seabed mining. It would be in line with the ISA's mandate under article 143(2) of the Convention to promote, encourage, and conduct marine scientific research and analysis as well as coordinate and disseminate the results.

The 'Catch-22', presumably, is that without commercial mining revenues, it will initially be difficult to establish such a fund. On the other hand, if such a fund were to be established by the future exploitation regulations, to come into effect after commercial exploitation contracts had already been awarded, this would arguably be too late. For fundamental research into the environmental effects of deep-seabed mining to be relevant to decision-making concerning the CHM, institutionalising its support should be one of the first steps, to be taken before irreversible decisions are made concerning commercial mining.

### 3.2. Public participation in value-based decisions

Linked to the previous section is the question of appropriate public participation. Governance of global common resources, especially when numerous uncertainties are involved, requires a weighing of societal risk and acceptability – in essence value judgments. Central is the consideration of what level of environmental harm is acceptable to society. Increased public engagement in the work of the ISA may reveal that environmental protection is seen as a long-term priority, as the following studies suggest.<sup>9</sup>

A 2012 survey by Jobstovogt et al. about deep-sea biodiversity in Scottish waters demonstrated that 73% of the Scottish public 'found it worth paying for protection of deep sea areas, because society would benefit from it in the long-term' [23]. The study concluded that 'policy makers are better off to consider the existence value that people associate with species protection in combination with the direct benefits of marine protection, and that overlooking non-users will

necessarily lead to undervaluation of marine ecosystems.' Another study by Glenn et al. demonstrated that the Irish public placed a high value on protecting cold-water deep corals off Ireland:

'87% of respondents agreed that they should be protected to provide [*inter alia*] raw materials for the biomedical industry, essential fish habitat and as a carbon sink to assist with climate change. 90% endorsed their protection for the benefit of the next and future generations and 84% considered that they should be protected purely in their own right given the unique and fragile ecosystem they represent' [24,25].

Some surveys have neglected to situate seabed mining within the broader context of sustainable development, which can distort the overall picture. Guirco and Cooper highlight this point by using the example of an Australian consultation on seabed mining, which disregarded questions about patterns of metal consumption and recycling opportunities [26]. Similarly, a survey conducted by the European Commission (EC) in 2014 to collect opinions about seabed mining from civil society, public authorities, research organisations, and the private sector did not inquire about 'increasing recycling'. This was because boosting resource efficiency and recycling are part of a separate pillar of the EC's Raw Materials Initiative' [27]. Nevertheless, numerous submissions, particularly from civil society, noted the need to consider the recycling of metals in the context of making decisions regarding seabed mining.<sup>10</sup>

All four groups of respondents to the EC survey suggested research on environmental impacts of deep-seabed mining was a clear priority action [27]. However, the responses also illustrated an overwhelming scepticism from civil society towards the possibility of deep-seabed mining contributing 'towards a sustainable and economical supply of raw material for EU industry and agriculture.' Many respondents from civil society urged for greater caution in dealing with the risks of deep-seabed mining:

'Most researchers and most private companies believe that deep-sea mining is not intrinsically better or worse than other marine activities but it depends on how and where it is done. The civil society response was different. They do consider the impact to be worse. Again our uncertain knowledge of potential damage was given as a reason for caution' [27].

Given that the ISA was established to act on behalf of humankind as a whole, including, but not limited to its member States, it will be necessary to ensure the participation of diverse stakeholders when making value-based decisions concerning what is a universally acceptable level of harm to the environment [10].

### 3.3. Debate the need for and alternatives to deep-seabed mining

The discussion in the previous section concerning balancing societal values, leads to the next consideration: assessing the need for deep-seabed mining, before the ISA gives it a green light. This would be

<sup>9</sup> The following discussion is based on A. Jaeckel, The International Seabed Authority and the Precautionary Principle, Brill, Leiden and Boston 2017, chapter 7.4.2.

<sup>10</sup> The responses to the survey are listed at [http://ec.europa.eu/dgs/maritimeaffairs\\_fisheries/consultations/seabed-mining/index\\_en.htm](http://ec.europa.eu/dgs/maritimeaffairs_fisheries/consultations/seabed-mining/index_en.htm).

in line with target 12.5 of the 2030 Agenda for Sustainable Development to ‘substantially reduce waste generation through prevention, reduction, recycling and reuse’ [28]. Such a discussion should, at a minimum, be framed in the context of current need, commodity markets, and existing alternatives. It conceivably might also include broader discussions about, for example:

- investing into new alternatives to deep-seabed mining, while also considering the risks these may carry;
- increasing the supply of raw materials now as opposed to preserving them for future generations;
- preserving ecosystem services until more is known about them;
- the implications of the duty to preserve rare or fragile ecosystems and ensure effective protection in the context of seabed mining and the potential for cumulative effects.<sup>11</sup>

The consideration of alternatives to potentially harmful practices, techniques, or specific elements thereof is considered to be part of environmental impact assessments and strategic environmental assessments [29–32] and is argued by some to be an element of the precautionary approach [33], to which the ISA is bound.<sup>12</sup> It may be queried whether the inter-generational aspect of the common heritage status of the Area further requires the ISA to consider under what conditions deep-seabed mineral mining should proceed, and if these conditions are being met currently. This would involve a debate over the necessity for seabed mining at present, beyond the fact that advances in technology may make seabed mining possible (though its economic profitability is by no means assured). It would entail consideration of what should be left to future generations; the risks and benefits of seabed mining now versus in the future when technology has improved and need has increased; potential alternatives, such as land-based mining, reprocessing of land-based tailings, recycling of metals from electronic waste and building material; and finally, how mineral demand could be reduced through substitution and greater efficiency.

In the broad context of sustainable development, and international commitments to it reflected in the UN Sustainable Development Goals, not only production patterns are relevant, but also the sustainability of consumption patterns [28]. Moreover, target 14.2 of the 2030 Agenda for Sustainable Development requires active restoration of the marine environment:

‘By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans’ [28].

The decision to further degrade the deep-sea marine environment will presumably not be taken lightly by the ISA, and will involve extensive public engagement, as discussed above. In making these considerations, the needs of future generations for mineral resources are pertinent:

‘With minerals and fossil fuels, the rate of depletion and the emphasis on recycling and economy of use should be calibrated to ensure that the resource does not run out before acceptable substitutes are available’ [18].

A 2016 study by Teske et al., prepared for the J.M. Kaplan Fund, Ocean 5, and Synchronicity Earth, found that even under a scenario of very high demand growth rates for key minerals by 2050, deep-seabed mining will likely not be necessary to meet the demand, without needing to take into account the real possibility of unanticipated new

major finds on land [34].

The results of any wider debate over mineral consumption and the green economy should be considered by the ISA [35]. However, the role of the ISA in such a debate is unclear. On the one hand, as the central organisation managing the Area on behalf of humankind and overseeing assessments of the environmental impacts of seabed mining in the Area, the ISA may be the suitable forum, through its Assembly, which in principle represents all States Parties to the LOSC. On the other hand, another organisation, such as the UN General Assembly, might be a more suitable forum for this discussion of global needs, as indeed it was in 1967 when Ambassador Pardo gave his galvanizing speech.<sup>13</sup>

### 3.4. Setting conservation targets

If and when it is determined, in light of the benefits and the public acceptability of the risks to the marine environment as well as the risks and benefits of alternatives, that deep-seabed mining will be conducted, it will be necessary to set conservation targets. These targets should take measure of the above-discussed societal imperatives, including what is sufficient knowledge gained through scientific research in order to set these targets, as well as the publicly acceptable level of harm to the marine environment that the targets will seek to contain. By setting appropriate targets, the ISA would need to ensure that deep-seabed mining effectively protects the marine environment and does not endanger the natural life-support systems, which include biodiversity and marine ecosystem services, upon which we are all reliant [18,36]. That said, it is well understood that deep-seabed mining will cause at least some long-term and irreversible damage, through destruction of habitat and organisms [4,6,37–40]. However, numerous uncertainties remain, particularly with respect to cumulative short- and long-term impacts on the marine environment [41]. In this context, the ISA would need to determine as best as possible, through the involvement of scientists, both within and outside of its committee structures, what type and level of impact from deep-seabed mining would pose risks of serious harm or endanger life-support systems [4]. Here, the ISA’s obligation to apply the precautionary approach is relevant, requiring it to err on the side of caution, as well as to determine acceptable risks in a transparent and participatory manner. Based on these determinations, the ISA would then be able to set preliminary conservation targets, which would also highlight whether deep-seabed mining is in fact currently feasible or not. If so, the focus shifts to establishing a regulatory and management framework for deep-seabed mining that ensures that the conservation targets (as well as societal and economic objectives) will be met.

### 3.5. Limiting environmental impacts & moving beyond the first-come-first-serve system

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’ are direct obligations of the ISA under article 145 of the Convention. The principle of common *heritage* of humankind adds to that a temporal dimension by requiring the conservation of natural and biological resources not only now, but for future generations. Several potential consequences follow from this.

First, in line with the aim of preserving not only the mineral resources but also the ecosystem structures and functions [42] for future generations, the ISA is looking into the role of a network of

<sup>13</sup> In what is now recognised as a seminal moment in the development of the international legal regime for the Area, Ambassador Arvid Pardo of Malta delivered a 14 page address to the UN General Assembly with the expressed purpose of providing a ‘brief explanation’ of why he disagreed that ‘there is no rush’ to develop a new legal regime regarding seabed resources. UNGA, UN Docs A/C.1./PV.1515 and A/C.1./PV.1516, 1 November 1967.

<sup>11</sup> See also LOSC, Article 194.

<sup>12</sup> See e.g. Nodules Exploration Regulations, Regulations 2, 5, 31; Seabed Disputes Chamber Advisory Opinion 2011.

representative no-mining areas in buttressing ecosystems to the disturbances caused by mining activities [43]. A remaining question is how this might be supplemented by other spatial and regional measures. Deep-seabed mining will undoubtedly cause some irreversible spatial disruptions, the scale of which is yet to be determined by scientific research for each of the three types of minerals. With appropriate management plans in place, no-mining areas would presumably support target 14.5 of the 2030 Agenda for Sustainable Development, which states: ‘By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information’ [28]. The more ambitious recommendations of experts in the field of conservation are also relevant, such as the statement from marine experts at the IUCN World Parks Congress (Sydney, 2014), which noted the need to ‘urgently increase’ marine protected areas (MPAs) to safeguard both biodiversity and ecosystem services. In their view, networks of MPAs should include, ‘[...] at least 30% of each marine habitat. The ultimate aim is to create a fully sustainable ocean, at least 30% of which has no-extractive activities’ [44]. When developing no mining areas in the Clarion-Clipperton Zone in the Pacific, experts suggested protecting 30–50 per cent of the total management area [45]. The environmental management plan for the Clarion-Clipperton Zone, as adopted by the ISA in 2012, protects approximately 25% of the management area [45].

In addition to no-mining areas, it will be necessary to determine thresholds for the various cumulative impacts on biota as well as ecosystem structures and functions arising directly and indirectly from total mining operations in a given region. This would, by extension, require a regionally determined upper limit of the intensity of mining at any given time, taking into account the size of individual operations, as well as how many active mining operations can be supported. A long-term holistic view of the cumulative impacts of current (or proposed) operations, would take into account the size, location, and duration of mining operations, in conjunction with those impacts arising from other sectors, as well as climate change [46,47]. Placing a limit on mining operations has to date not been discussed, and would likely be controversial, triggering difficult questions, such as how to determine when contracts should no longer be granted, and under what conditions a new tranche could be made available.

The current system applicable to the Area enables the acquisition of exploration contracts on a first-come-first-serve basis with no determined global or regional limit. The zero draft exploitation regulations envisage the same process [3]. If an upper limit was to be established, it might better serve the purposes of intra- and inter-generational equity to move beyond this first-come-first-serve system. This would help to not unduly disadvantage developing States, which may only be in a position to apply for a contract at a later stage when they have generated the necessary resources. Indeed, the parallel system of banking reserved areas for future exploitation by developing States, as originally envisaged in Part XI of the LOSC, was created with the active participation of developing States in mind. As we discuss elsewhere, the implementation of that parallel system has been changed by the ISA’s Mining Code [9]. Common alternatives to the first-come-first-serve system are to grant resource contracts by tender or auction [48].

In addition to these direct measures to protect the marine environment, two further measures can be derived from the environmental dimension of the CHM principle: preservation of mineable sites for future generations and compensation for environmental harm.

### 3.6. Preserving mineable sites for future generations

Closely linked to limiting the environmental impacts of deep-seabed mining is the question whether, and if so how much of, the common heritage should be preserved to ensure mineral resources for future generations. As noted in the Brundtland Report: ‘Sustainable development requires that the rate of depletion of non-renewable resources

should foreclose as few future options as possible’ [18]. Questions here include the quantity of mineable sites that should be preserved for future generations as well as the schedule by which these sites may be released in the future. All this will be difficult to determine given that the size, extent, and locations of deep-seabed mineral resources are still largely unknown. In the face of such incomplete knowledge, the precautionary approach is recommended.

### 3.7. A compensation scheme for environmental harm

As a last resort, compensation for serious environmental harm would need to be considered under the CHM regime. Transboundary environmental harm in the context of land-based mining is subject to international law of state responsibility and usually requires remediation and financial compensation. However, contrary to States that ‘only’ represent the interests of their citizens, the ISA must, in addition to the interests of its States Parties, act on behalf of humankind as a whole. The question then arises as to what kind of compensation, if any, would be required in the case of serious environmental harm caused by seabed mining? The ISA’s technical study no. 11 summarises the issue:

‘[...] even under the best of intentions and using the best technology, seabed mining is inherently destructive to the seabed and parts of the water column. [...] The environmental implications of seabed mining under the common heritage concept is complicated and is comparable only to the emerging issues surrounding international greenhouse gas regulation. If environmental degradation of the marine ecosystem is inherent in seabed mining and if remediation is not practical or technologically possible, the logical alternative is financial compensation for the environmental damage and loss of ecosystem services from the seabed. While compensation might take place under the royalties and fees provisions in the UNCLOS Treaty, this approach is quite different from the logic used to justify royalties in terrestrial mining agreements’ [48].

Any such compensation scheme would have to be developed in the context of the ISA’s regulations for the exploitation of minerals. Questions that would need to be discussed include who would be compensated, for what, and how would causation be proven. Ocean processes operate on very long timescales. It is likely that some of the harmful changes to ecosystem structures, functions, and resulting ecosystem services will only be detected decades after mining has commenced [49].

Of course, a regulatory framework with clear and measurable conservation targets will be necessary to help prevent serious environmental harm from occurring in the first place, and furthermore, such a framework will need to be readily adaptive to new information as it arises. Notwithstanding the best intentions of regulation, a compensation scheme should be envisioned to address unanticipated inequities if, and ultimately when, serious harm occurs to the CHM.

### 3.8. Implications for enforcement of the legal framework

The special legal status of the Area and its resources also affects the extent to which environmental obligations can be enforced. In its 2011 Advisory Opinion, the Seabed Disputes Chamber faced the question of who would be entitled to claim compensation from a State that sponsored activities in the Area following a breach of obligations and the occurrence of environmental harm. First, the Chamber envisaged that compensable damage ‘would include damage to the Area and its resources constituting the common heritage of mankind, and damage to the marine environment.’<sup>14</sup> This suggests that pure environmental harm, i.e. without direct impact on any particular State, could give rise

<sup>14</sup> Seabed Advisory Opinion 2011, paragraph 179.

to enforcement proceedings and the payment of damages.

Second, the Chamber speculated that a range of actors may be entitled to bring a case against a sponsoring State in breach of its obligations: 'Subjects entitled to claim compensation may include the Authority, entities engaged in deep seabed mining, other users of the sea, and coastal States.'<sup>15</sup> Particularly important here is the idea that the ISA itself may be entitled to claim compensation. Although this is not explicitly stated in the LOSC, the Chamber argues that such entitlement is implicit in the ISA's obligation to act on behalf of humankind.<sup>16</sup> Compensation under the CHM principle could help drive both the stringency and enforceability of the ISA's environmental standards for seabed mining.

Third, the Chamber notes that 'each State Party may [...] be entitled to claim compensation in light of the *erga omnes* character of the obligations relating to preservation of the environment of the high seas and in the Area.'<sup>17</sup> An '*erga omnes* obligation' is an obligation owed to the international community as a whole as opposed to only to an injured party. French summarises the significance of this finding: 'The potentially radical claims made by the Chamber should not be lost here – the finding of *erga omnes* obligations, the affirmation of essentially what would be an *actio popularis* in international environmental law, [...] and the institutional right to claim' [50]. In other words, it may be possible for *any* State to start legal action and claim compensation for serious environmental harm to the Area and the high seas. This could increase the risks for mining contractors and sponsoring States to be exposed to legal proceedings, even if no particular State or other actor has been directly affected. Needless to say, this has not yet been tested.

#### 4. Conclusion

The Area regime offers the most detailed and advanced articulation of a concept that requires a paradigm shift in our thinking: the principle of common heritage of humankind.

In order to prevent States from asserting claims over ever larger portions of the oceans, it was agreed that the Area and its resources are to be managed through a common entity, the ISA, in a manner that ensures equity between developing and developed States as well as between present and future generations. The inter-generational dimension closely links the CHM principle to the concept of sustainable development. In order to achieve the aims of sustainable development, it will first have to be determined what constitutes effective protection from harmful effects and which levels of environmental impacts may cause serious harm or endanger the Earth's life-support systems, including biodiversity and marine ecosystem services. Only afterwards can it be assessed what site-specific, regional and broader limits are sufficiently effective protection. In this context, the ISA would need to consider a number of measures that follow from the CHM principle, as discussed in this article, beginning with the strategic funding of marine scientific research to generate further knowledge about the fragility and resilience of specific deep ocean ecosystems to disturbances likely to be associated with deep-seabed mining. These results will need to be placed in the context of cumulative impacts from a broader suite of stressors including those generated by climate change.

Given that the ISA manages the Area and its resources on behalf of humankind as a whole, it is appropriate that public opinions are taken into serious account regarding the risks and benefits of seabed mining and of alternatives, the value of marine ecosystems, and the sharing of benefits intra-generationally as well as inter-generationally. If it is determined, in light of alternatives, that deep-seabed mining should occur, the ISA will need to set conservation targets that reflect best scientific knowledge as well as a level of harm to the marine environ-

ment that is broadly acceptable to society, without causing serious harm to marine biodiversity or ecosystem structure, functions and associated services [18].

With such targets in mind (as well as those for economic and societal objectives, not discussed here), the ISA will then want to consider a range of measures to limit the effects of seabed mining on the marine environment. These may include site-specific measures, systems of no-mining areas, and regional limits on the magnitude of cumulative activities. The ISA could also consider whether some mineable sites should be preserved for future generations and whether to set up a compensation scheme in case serious environmental harm does occur. Lastly, it is prudent to consider how the CHM principle affects the enforcement of the legal framework for deep-seabed mining, by allowing for the possibility that the ISA, as well as any State, may claim compensation in case of harm to the environment of the high seas and the Area resulting from deep-sea mining.

Given the above suite of considerations, it is clear that the ISA will need to further develop, and agree upon, the practical implications of the CHM principle. Over and above best practices within national jurisdiction concerning environmental protection, the ISA will need to define measures, standards, and actions through which the environmental aspects unique to the CHM principle can be given effect. The options discussed in this paper (as well as those proposed by others [4,10,20,21,51]) would require time to be considered and implemented. In the context of the present sense of urgency by some States to move towards commercial-scale exploitation of seafloor minerals, the CHM principle provides a countervailing force. As this paper has sought to demonstrate, managing the common heritage of humankind requires taking a long-term perspective that considers the interests of both present and future generations as well as cumulative impacts on the marine environment.

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<sup>15</sup> Ibid, paragraph 179.

<sup>16</sup> Ibid, paragraph 180; LOSC, Article 137(2).

<sup>17</sup> Seabed Advisory Opinion 2011, paragraph 180.

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