
Centre for International
Governance Innovation



Liability Issues for Deep Seabed Mining Series | Paper No. 8 – February 2019

Liability for Environmental Harm from Deep Seabed Mining Activities: Defining Environmental Damage

Ruth Mackenzie

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CIGI Masthead

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About the Project

The Liability Issues for Deep Seabed Mining project was developed by the Centre for International Governance Innovation (CIGI), the Commonwealth Secretariat and the Secretariat of the International Seabed Authority (ISA) to assist in clarifying legal issues of responsibility and liability underpinning the development of exploitation regulations for the deep seabed. CIGI, in collaboration with the ISA Secretariat and the Commonwealth Secretariat, in 2017, invited leading legal experts to form the Legal Working Group on Liability for Environmental Harm from Activities in the Area (LWG) to discuss liability related to environmental damage, with the goal of providing the Legal and Technical Commission, as well as members of the ISA with an in-depth examination of potential legal issues and avenues.

Papers in the series cover the following topics: the current legal architecture for liability/responsibility under the United Nations Convention on the Law of the Sea; the scope of activities covered under a liability regime; the responsible parties; the potential claimants; the range of recoverable damages; and the appropriateness of using insurance and compensation funds to ensure adequate resources for compensation. CIGI Senior Fellow Neil Craik coordinated the development of the paper series.

About the LWG

The LWG was co-convened by CIGI, the Commonwealth Secretariat and the Secretariat of the ISA, under the joint direction of Neil Craik (CIGI), Hannah Lily (Commonwealth Secretariat) and Alfonso Ascencio-Herrera (ISA Secretariat). Other members of the LWG were invited based on their expertise in areas related to international law of state responsibility and liability, international environmental law and law of the sea. While working under the auspices of the ISA, the LWG is an independent group of legal experts.

The members of the LWG are:

- Alfonso Ascencio-Herrera, Deputy Secretary-General, ISA
- Christopher Brown, Legal Officer, ISA
- Eden Charles, Independent Consultant on International Law, and Former Deputy Permanent Representative of Trinidad and Tobago to the United Nations*
- Neil Craik, Senior Fellow, CIGI, and Professor of Law, University of Waterloo*
- Tara Davenport, Research Fellow, Centre for International Law, National University of Singapore*
- Elie Jarmache, Special Adviser on the Law of the Sea, Member, Legal and Technical Commission, ISA
- Hannah Lily, Legal Adviser, Commonwealth Secretariat*
- Ruth Mackenzie, Reader in International Law, University of Westminster*
- Stephen E. Roady, Professor of the Practice of Law, Duke University School of Law
- Andres Rojas, Diplomat, Ministry of Foreign Affairs and Worship, Argentina*
- Dire Tladi, Professor, University of Pretoria, and Member, International Law Commission
- Guifang (Julia) Xue, Professor, KoGuan Law School, Shanghai Jiao Tong University*

*Contributing authors to the paper series.

About the Author

Ruth Mackenzie is reader in international law at the University of Westminster, where she teaches and researches in the fields of international environmental law, law of the sea, and the law and policy of international courts. Prior to joining Westminster Law School, Ruth was principal research fellow and deputy director of the Centre for International Courts and Tribunals at University College London and director of the Biodiversity and Marine Resources Programme at the Foundation for International Environmental Law and Development. She qualified as a solicitor in England and Wales (not practising). Ruth has acted as a consultant to the United Nations Environment Programme and the United Nations University Institute of Advanced Studies on issues related to biodiversity and biosafety. She was a member of the International Law Association Committee on Biotechnology and International Law and is a member of the International Union for Conservation of Nature Commission on Environmental Law.

Acronyms and Abbreviations

CHM	common heritage of mankind
CLC	International Convention on Civil Liability for Oil Pollution Damage
CRAMRA	Convention on the Regulation of Antarctic Mineral Resources Activities
FAO	Food and Agriculture Organization of the United Nations
HEA	habitat equivalency analysis
HNS	hazardous and noxious substances
HNS Convention	International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances at Sea
ICJ	International Court of Justice
ILC	International Law Commission
IOPC Funds	International Oil Pollution Compensation Funds
ISA	International Seabed Authority
ITLOS	International Tribunal for the Law of the Sea
LOSC	United Nations Convention on the Law of the Sea
LWG	Legal Working Group on Liability for Environmental Harm from Activities in the Area
SDC	Seabed Disputes Chamber
UNCC	United Nations Compensation Commission

Executive Summary

This paper explores issues relating to defining environmental damage in a potential liability regime for deep seabed mining activities in the Area. The paper reviews approaches to environmental damage in existing liability regimes and processes established in international law in relation to other activities and areas, with a view to providing information and examples that might be useful to further consideration of the definition and valuation of environmental damage arising from deep seabed mining activities. It also identifies some of the considerations relating to mining activities in the Area that pose specific challenges for addressing the definition and valuation of environmental damage.

Introduction

Part XI of the United Nations Convention on the Law of the Sea (LOS)¹, the 1994 Implementing Agreement and the regulations adopted by the International Seabed Authority (ISA) set out a regulatory regime that is, *inter alia*, designed to ensure effective protection of the marine environment against harmful effects that may arise from activities in the Area. Part XI and the ISA Regulations also make reference to responsibility and liability for damage. The Seabed Disputes Chamber (SDC) of the International Tribunal of the Law of the Sea (ITLOS) provided further guidance on these provisions, in particular in relation to the responsibilities and liabilities of sponsoring states, in its 2011 Advisory Opinion.²

Notwithstanding these instruments and the Advisory Opinion, as the ISA develops Exploitation Regulations with a view to the commencement of seabed mining activities, a number of issues relating to liability for any damage arising from those activities remain to be addressed. As part of the work of the Legal Working Group on Liability

for Environmental Harm from Activities in the Area (LWG), and on the assumption that further rules and procedures on liability will need to be developed,³ this paper explores approaches to defining compensable environmental damage. This question is closely connected to other aspects of the LWG's work (addressed in other papers in this series), including the scope of any liability regime.

A number of liability regimes have been established in international law in relation to activities that may give rise to damage to the environment. More general principles and rules relating to liability for environmental damage have also been considered in other contexts. Approaches to the definition, assessment and valuation of environmental damage taken in such instruments and processes may provide some models and insights for further discussions on liability for damage from activities in the Area. The principal purpose of this paper, therefore, is to outline and explain the approaches to the definition of environmental damage taken in these agreements and processes.

The paper also seeks to identify, on a preliminary basis, some specific considerations and factors that may need to be considered in defining environmental damage in any liability regime to be developed in relation to deep seabed mining activities.

Liability and Compensation for Environmental Damage in International Law

This section reviews existing approaches to liability and compensation for environmental damage in international instruments and processes. In international agreements addressing liability for environmental damage, two principal approaches have been adopted. First, numerous agreements establish civil liability regimes that make provision for monetary compensation for

1 United Nations Convention on the Law of the Sea, 10 December 1982, 1833 UNTS 397 (entered into force 16 November 1994) [LOS].

2 SDC of ITLOS, *Responsibilities and Obligations of States Sponsoring Persons and Entities with Respect to Activities in the Area* (2011), Advisory Opinion, No 17 [SDC Advisory Opinion 2011].

3 Throughout this paper, for convenience, the terms "liability regime" or "potential liability regime" are used. This is not intended to prejudice the legal form or nature that any further rules and procedures on liability might take.

covered damage. As Akiho Shibata has observed, in a civil liability system, “the concept of damage sets the parameters for monetary compensation.”⁴ Some other instruments reflect an administrative approach to liability, in which “the concept of damage functions primarily as a trigger for the operator and the administrative organ to take action in relation to damage.”⁵ Examples of the definition of environmental damage in these two types of agreements are examined in this section. Then, this section briefly reviews some approaches to the definition and valuation of environmental damage in the work of the United Nations Compensation Commission (UNCC), the International Law Commission (ILC) and the International Court of Justice (ICJ).

International Agreements Addressing Civil Liability for Environmental Damage

Several international agreements have been adopted that address liability for damage arising out of activities that pose risks to the environment. Most of these instruments establish rules and procedures relating to civil liability. To the extent that they address environmental damage, most cover only such damage occurring within national jurisdiction. Several instruments address activities posing risks in relation to the marine environment, including the most well-known and “active” regime applicable to oil pollution damage.

Each of these international agreements sets out a scope and approaches tailored to the particular risk and/or environment that they address. They reflect the types of damage that might be caused by the activity or substances in question, and they reflect the degree of consensus among states about the nature and scope of risks posed and potential harm. In that sense, clearly there is not a single model that could be transposed and adopted for seabed mining activities. Nonetheless, these existing instruments, and any practice thereunder, might usefully inform discussions about liability for environmental damage in the context of activities in the Area. The fact that most of the instruments surveyed in this section

adopt a civil liability approach is not intended to prejudge the nature of any rules and procedures on liability that might be adopted in respect of damage arising from activities in the Area.

The instruments surveyed here address liability for damage relating to oil pollution;⁶ nuclear energy;⁷ carriage of hazardous and noxious substances (HNS) at sea;⁸ bunker oil pollution;⁹ hazardous wastes;¹⁰ industrial accidents on transboundary waters;¹¹ and, more generally, activities dangerous to the environment.¹² This list gives a sense of the diversity of instruments. The fact that several of these instruments have so far failed to enter into force serves to highlight the challenge of establishing widely accepted international rules governing liability and compensation for damage.

It is worth noting at the outset that the instruments surveyed here often cover traditional heads of damage, such as damage to property. For example, the 1992 International Convention on Civil Liability for Oil Pollution Damage (1992 CLC)

4 Akiho Shibata “A new dimension in international liability regimes” in Akiho Shibata, ed, *International Liability Regime for Biodiversity Damage: The Nagoya-Kuala Lumpur Supplementary Protocol* (New York: Routledge, 2014) at 36.

5 *Ibid.*

6 *International Convention on Civil Liability for Oil Pollution Damage*, 27 November 1992, IMO LEG/CONF.9.15 (entered into force 30 May 1996) [1992 CLC]; *International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage*, 27 November 1992, IMO LEG.CONF.9/16 (entered into force 30 May 1996) [1992 Fund Convention]; *Protocol of 2003 to the 1992 Fund Convention*, 16 May 2003, IMO LEG/CONF.14/DC/2 (entered into force 3 March 2005) (together, the 1992 Fund and the Supplementary Fund are referred to as the International Oil Pollution Compensation [IOPC] Funds).

7 *Convention on Third Party Liability in the Field of Nuclear Energy*, 29 July 1960, 956 UNTS 251 (entered into force 1 April 1968) (amended by 1964 and 1982 Protocols [1960 Paris Convention] and amended by 2004 Protocol, 12 February 2004, [not in force] [2004 Nuclear Liability Protocol]) (see Nuclear Energy Agency, “2004 Protocol to Amend the Paris Convention”, online: <www.oecd-nea.org/law/paris-convention-protocol.html>; *Vienna Convention on Civil Liability for Nuclear Damage*, 21 May 1963, 1063 UNTS 265 (entered into force 12 November 1977) (amended by 1997 Protocol, 36 ILM 1462) [1963 Vienna Convention]; *Convention on Supplementary Compensation for Nuclear Damage*, 12 September 1997, 36 ILM 1473 (entered into force 15 April 2015).

8 *International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances at Sea*, 3 May 1996, 25 ILM 1406 (not in force) and 2010 Protocol [1996 HNS Convention].

9 *International Convention on Civil Liability for Bunker Oil Pollution Damage*, 27 March 2001, IMO LEG/CONF.12/19 (entered into force 21 November 2008) [2001 Bunker Convention].

10 *Protocol on Liability and Compensation for Damage Resulting from Transboundary Movement of Hazardous Wastes and Their Disposal*, 9 December 1999, UNTS 120 (2005) (not in force) [Basel Liability Protocol].

11 *Protocol on Civil Liability and Compensation for Damage Caused by the Transboundary Effects of Industrial Accidents on Transboundary Waters*, 21 May 2003, ECE/MP.WAT/11-ECE/CP.TEIA/9 (not in force).

12 *1993 Lugano Convention on Civil Liability for Damage resulting from Activities Dangerous to the Environment*, 21 June 1993, 32 ILM 1228 (not in force) [Lugano Convention].

defines “pollution damage” as including “loss or damage caused outside the ship by contamination resulting from the escape or discharge of oil from the ship, wherever such escape or discharge may occur.”¹³ Pollution damage also includes the costs of preventive measures and further loss or damage caused by preventive measures (discussed further below in relation to environmental damage). The 1996 International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances at Sea (HNS Convention) includes within its definition of damage, loss of life or personal injury on board or outside a ship carrying HNS caused by those substances, as well as loss of or damage to property outside a ship carrying HNS caused by those substances.¹⁴ Such examples and approaches may be relevant in addressing damage to persons and property arising out of activities in the Area, but, in light of the focus on environmental harm here, they are not addressed further in this paper.

For the purposes of this paper, the key feature of these agreements is the definition of damage that they adopt as it relates to the environment and any practice under the agreements relating to claims for such damage. The definition, and compensability, of damage to the environment varies under the agreements.¹⁵ Some early instruments contain no specific reference to damage to the environment. Commonly accepted formulations include within the definition of compensable damage:

- loss of profit arising from impairment to the environment;
- reasonable measures of reinstatement of the environment undertaken or to be undertaken; and
- reasonable preventive measures.

As discussed below, several instruments also include the introduction of equivalent components of the environment where reinstatement is not possible.

The civil liability regime established for oil pollution damage covers “impairment of the environment” within the definition of “pollution damage.” However, other than loss of profit from such impairment, this is limited to “the costs of reasonable measures of reinstatement actually undertaken or to be undertaken.”¹⁶ As noted above, “preventive measures” are also covered, defined as “any reasonable measures taken by any person after an incident has occurred to prevent and minimize pollution damage.”¹⁷ Similar approaches to the definition of compensable environmental damage are taken, for example, in the 2001 Convention on Civil Liability for Bunker Oil Pollution Damage,¹⁸ and the 1996 HNS Convention and its 2010 Protocol.¹⁹

While some national courts have taken a different approach,²⁰ the IOPC Fund has maintained that compensation for impairment to the environment is limited to the measures listed above. The IOPC Fund’s 2016 annual report notes that, in addition to property damage, admissible claims include economic losses by the fishing industry or those engaged in mariculture and economic losses in the tourism sector, i.e., loss of profit from impairment of the environment. Claims also include costs of clean-up operations at sea and on shore, and costs of reinstatement of the environment. In particular, in the oil pollution regime, there has been a resistance to the idea of compensating “pure” environmental damage (or pure ecological loss), i.e., non-economic values associated with environmental damage.²¹ Such damage would require different means of assessment and valuation, including potentially theoretical models of valuation. In 1980, Fund Assembly Resolution No. 3 stated that assessment of compensation by the (1971) Fund would not be made on the basis of an abstract quantification of damage calculated in

13 1992 CLC, *supra* note 6, art 1(6)(a).

14 1996 HNS Convention, *supra* note 8, art 1(6)(a), (b).

15 See generally Louise de La Fayette, “The Concept of Environmental Damage in International Liability Regimes” in Michael Bowman & Alan Boyle, eds, *Environmental Damage in International and Comparative Law: Problems of Definition and Valuation* (Oxford, UK: Oxford University Press, 2002) 149–89; Edward HP Brans, *Liability for Damage to Public Natural Resources: Standing, Damage and Damage Assessment* (The Hague: Kluwer Law International, 2001).

16 1992 CLC, *supra* note 6, art 1(6)(a).

17 *Ibid*, arts 1(6)(b), (7).

18 2001 Bunker Convention, *supra* note 9, art 1(9).

19 1996 HNS Convention, *supra* note 8, arts 1(6)(c), (d).

20 See Philippe Sands & Jacqueline Peel, *Principles of International Environmental Law*, 4th ed (Cambridge, UK: Cambridge University Press, 2018) at 784–88.

21 *Ibid* at 750.

accordance with theoretical models.²² This position has been maintained, most recently in guidelines for presenting claims for environmental damage published by the IOPC Funds in 2018.²³ These guidelines address claims for costs of post-incident studies and reinstatement measures. The guidelines discuss, *inter alia*, specific criteria for reinstatement measures, which focus on accelerating and enhancing the recovery of the damaged component of the environment and establish that the costs of reinstatement must be proportionate to the extent and duration of the damage and the benefits likely to be achieved.²⁴ Measures taken at some distance from the damaged area, but still within the general vicinity, may be acceptable as long as it can be demonstrated that they would actually enhance the recovery of the damaged components of the environment and the services those components provide.²⁵ However, replacing a damaged site by “creating” an equivalent resource elsewhere may not satisfy the criteria.²⁶ The guidelines acknowledge that there is little experience of admissible claims for reinstatement measures.²⁷

The original 1960 Paris Convention on Third Party Liability in the Field of Nuclear Energy and the 1963 Vienna Convention on Civil Liability for Nuclear Damage did not cover environmental damage. However, the Vienna Convention did envisage that loss or damage not explicitly included in the definition of nuclear damage in the convention could be covered if and to the extent that the law of the competent court allowed.²⁸ The 2004 Protocol to Amend the 1960 Paris Convention on Third Party Liability in the Field of Nuclear Energy would add to the definition of nuclear damage impairment of the environment in terms similar to that of the 1992 CLC. The costs of measures of reinstatement of the impaired environment are included, unless

such impairment is “insignificant.”²⁹ “Measures of reinstatement” are defined as “any reasonable measures which have been approved by the competent authorities of the State where the measures were taken, and which aim to reinstate or restore damaged or destroyed components of the environment, or to introduce, where reasonable, the equivalent of these components into the environment. The legislation of the State where the nuclear damage is suffered shall determine who is entitled to take such measures.”³⁰ Thus, the Protocol envisages not only reinstatement or restoration but also potentially the introduction of equivalent components of the environment. The Protocol also defined “reasonable measures” as

measures which are found under the law of the competent court to be appropriate and proportionate, having regard to all the circumstances, for example:

- 1) the nature and extent of the nuclear damage incurred or, in the case of preventive measures, the nature and extent of the risk of such damage;
- 2) the extent to which, at the time they are taken, such measures are likely to be effective; and
- 3) relevant scientific and technical expertise.³¹

A Protocol to the 1963 Vienna Convention, adopted in 1997, provided an expanded definition of nuclear damage in the same terms of the 2004 Protocol to the Paris Agreement. Nonetheless, the convention, as amended by the Protocol, would still not require environmental damage to be compensated, except to the extent determined by the law of the competent court.³²

In the 1993 Lugano Convention on Civil Liability for Damage Resulting from Activities Dangerous to the Environment, while the basic definition of environmental damage is similar to that in the 1992 CLC, loss of income deriving from a direct economic interest in any use or enjoyment of the environment is only recoverable if incurred as a result of a

22 IOPC Funds, *Resolutions of the 1971 Fund*, Resolution No 3 – Pollution Damage (October 1980) at 5, online: <https://documentservices.iopcfunds.org/fileadmin/IOPC_Upload/Downloads/English/RES_71_e.pdf>.

23 IOPC Funds, *Guidelines for presenting claims for environmental damage*, 2018 ed (London, UK: IOPC Funds, 2018), online: <www.iopcfunds.org/uploads/tx_iopcpublishations/IOPC_Environmental_Guidelines_ENGLISH_2018_WEB_01.pdf>.

24 *Ibid* at para 4.3.

25 *Ibid*.

26 *Ibid* at para 5.22.

27 *Ibid* at para 5.11.

28 1963 Vienna Convention, *supra* note 7, art 1.1(k)(ii); Sands & Peel, *supra* note 20 at 776.

29 2004 Nuclear Liability Protocol, *supra* note 7, art 1.B, amending article 1(a) of the 1960 Paris Agreement.

30 *Ibid*.

31 *Ibid*.

32 1997 Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage, *supra* note 7, art 2(2).

significant impairment of that environment. “Measures of reinstatement” are defined as “[a]ny reasonable measures aiming to reinstate or restore damaged or destroyed components of the environment or to introduce, where reasonable, the equivalent of these components into the environment. Internal law may indicate who will be entitled to take such measures.”³³

Thus, the Lugano Convention specifically envisaged the possibility of introduction of equivalent components of the environment, potentially in situations in which reinstatement or restoration was not possible.³⁴ It also raised the question of who might be entitled to take such measures, leaving this matter to domestic law to resolve. Moreover, article 2(10) of the Lugano Convention provided a broad definition of “environment” for these purposes to include:

- natural resources both biotic and abiotic, such as air, water, soil fauna and flora and the interaction between the same factors;
- property which forms part of the cultural heritage; and
- the characteristic aspects of the landscape.

While this convention is regional in scope and did not attract sufficient ratifications to enter into force, it represents a more comprehensive attempt to define and provide for compensation for potential environmental harm, both in terms of the definition of environment and the measures for which compensation may be recoverable.

The 1999 Basel Liability Protocol, addressing damage from the transboundary movement of hazardous wastes and their disposal, covers environmental damage along the same lines as the 1992 CLC, but also includes within its definition of measures of reinstatement “any reasonable measures aiming to assess, reinstate or restore damaged or destroyed components of the environment. Domestic law may indicate who will be entitled to take such measures.” Thus, costs of reasonable measures to assess damaged

or destroyed components of the environment are also specifically recoverable in this instance.³⁵

Guidelines on liability adopted under the Barcelona Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean³⁶ include within the scope of compensation for environmental damage “diminution in value of natural or biological resources pending restoration” and “compensation by equivalent if the impaired environment cannot return to its previous condition.”³⁷ The guidelines note that where compensation is granted for these types of damage, it should be earmarked for intervention in the environmental field in the Mediterranean Sea area.³⁸ The guidelines are also to apply to damage caused by pollution of a diffuse character, provided it is possible to establish a causal link between the damage and activities of individual operators.³⁹

Other Agreements Addressing Liability for Environmental Damage

A few agreements have been adopted that reflect an administrative approach to liability for environmental damage, focusing primarily on response and restoration measures.

The 2010 Nagoya-Kuala Lumpur Supplementary Protocol to the Cartagena Protocol on Biosafety⁴⁰ addresses damage to biodiversity in a field in which regulation is intended to be guided by the

³³ Lugano Convention, *supra* note 12, art 2(8).

³⁴ The approach in the Lugano Convention is also reflected in the 2003 Protocol on Civil Liability and Compensation for Damage Caused by the Transboundary Effects of Industrial Accidents on Transboundary Waters, *supra* note 11.

³⁵ See also discussion of the practice of the UNCC below.

³⁶ *Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean*, 16 February 1976, 15 ILM 290 (entered into force 1 February 1979), as amended June 1995, UNEP(OCA)/MED IG.6/7 (entered into force 9 July 2004) [*Barcelona Convention*].

³⁷ *Barcelona Convention, Decision IG 17/4 Guidelines for the Determination of Liability and Compensation resulting from Pollution of the Marine Environment of the Mediterranean Sea Area*, UNEP(DEPI)/MED IG.17/10 (2008), Annex V at paras 10(d), (e). Paragraph 10 also covers the types of environmental damage discussed above in relation to other agreements: activities and studies to assess damage; costs of preventive measures; and costs of measures taken or to be undertaken to clean up, restore and reinstate the impaired environment.

³⁸ *Ibid* at para 13.

³⁹ *Ibid* at para 15.

⁴⁰ *Nagoya-Kuala Lumpur Supplementary Protocol on Liability and Redress to the Cartagena Protocol on Biosafety*, 15 October 2010, 50 ILM 108 (entered into force 5 March 2018) [*Nagoya-Kuala Lumpur Protocol*]. See Akiho Shibata, ed, *International Liability Regime for Biodiversity Damage: the Nagoya-Kuala Lumpur Supplementary Protocol* (New York: Routledge, 2014).

precautionary approach. The Protocol applies to damage resulting from living (genetically) modified organisms that have been subject to transboundary movement. In the Protocol, “damage” is defined as:

an adverse effect on the conservation and sustainable use of biological diversity, taking also into account risks to human health, that:

- i) is measurable or otherwise observable taking into account, wherever available, scientifically-established baselines recognized by a competent authority that takes into account any other human induced variation and natural variation; and
- ii) is significant.⁴¹

A “significant” adverse effect for the purpose of the Nagoya-Kuala Lumpur Supplementary Protocol is to be determined on the basis of factors, such as:

- a) The long-term or permanent change, to be understood as change that will not be redressed through natural recovery within a reasonable period of time;
- b) The extent of the qualitative or quantitative changes that adversely affect the components of biological diversity;
- c) The reduction of the ability of components of biological diversity to provide goods and services;
- d) The extent of any adverse effects on human health in the context of the Protocol.⁴²

Thus, the Nagoya-Kuala Lumpur Protocol defines damage by reference to significant adverse effects and refers to scientifically established baselines in relation to the measurement of adverse effects. The Protocol takes an administrative approach, addressing response measures in the event of damage or where relevant information indicates that there is a sufficient likelihood that damage will result if timely response measures are not taken.⁴³ Under the Protocol, parties are to require the

operator(s), in the event of damage, to inform the competent authority, evaluate the damage and take appropriate response measures.⁴⁴ The competent authority is to identify the operator that caused the damage, evaluate the damage and determine which response measures should be taken by the operator. If the operator fails to act, the competent authority may implement appropriate response measures and has the right to recover costs from the operator.⁴⁵ “Response measures” may also be required in order to avoid damage.⁴⁶ Response measures are defined in the Protocol as reasonable actions to:

- i) Prevent, minimise, contain, mitigate, or otherwise avoid damage, as appropriate;
- ii) Restore biological diversity through actions to be undertaken in the following order of preference:
 - a. Restoration of biological diversity to the condition that existed before the damage occurred, or its nearest equivalent; and where the competent authority determines this is not possible;
 - b. Restoration by, *inter alia*, replacing the loss of biological diversity with other components of biological diversity for the same, or another type of use either at the same or, as appropriate, at an alternative location.⁴⁷

Thus, in relation to response measures, the Protocol acknowledges that restoration may not be possible and provides the alternative of the replacement of “lost” or damaged biodiversity with an equivalent or replacing the “use” of the affected biodiversity *in situ* or at another location.

Two agreements have been adopted relevant to Antarctic mining activities, environmental protection and liability. The 1988 Convention on the Regulation of Antarctic Mineral Resources Activities (CRAMRA)⁴⁸ has not entered into force. However, it may be of particular interest in discussions concerning liability for environmental

41 Nagoya-Kuala Lumpur Protocol, *supra* note 40, art 2(2)(b).

42 *Ibid*, art 2(3).

43 *Ibid*, arts 5(1), (3). For a similar approach, see Annex VI to the 1991 Protocol on Environmental Protection to the Antarctic Treaty, discussed below.

44 *Ibid*, art 5(1).

45 *Ibid*, arts 5(4), (5).

46 *Ibid*, art 5(3).

47 *Ibid*, art 2(2)(d).

48 Convention on the Regulation of Antarctic Mineral Resource Activities, 2 June 1988, 27 ILM 868 (not in force) [1988 CRAMRA].

harm from activities in the Area as it envisaged a relationship between sponsoring states and operators in relation to mineral resource exploitation in Antarctica, and it addressed mining activities in an area beyond national jurisdiction,⁴⁹ to which the principle of “common heritage of mankind” (CHM) has relevance.⁵⁰ Article 1(15) of CRAMRA provides: “Damage to the Antarctic environment or dependent or associated ecosystems means any impact on the living or non-living components of that environment or those ecosystems, including harm to atmospheric, marine or terrestrial life, beyond that which is negligible or which has been assessed and judged to be acceptable pursuant to this Convention.”

This definition addresses both living and non-living components of the environment or ecosystems. The reference to damage “which has been assessed and judged to be acceptable pursuant to this Convention” appears to relate the regulatory objective to protect and preserve the Antarctic environment and to allow mineral resource activities only where it is judged, based upon assessment of possible impacts on the Antarctic environment and on dependent and associated ecosystems, that the activity in question would not cause significant adverse effects.⁵¹ It is not linked to specific criteria or indicators that might define and revise acceptable levels of damage, and as the convention has not entered into force, it cannot be expected that this definition will be further elaborated in practice. Article 8 of CRAMRA establishes certain rules and procedures for response action and liability. Under this provision, operators undertaking any Antarctic mineral resource activity would have to take necessary and timely response action if that activity results in or threatens to result in damage to the Antarctic environment or dependent or associated ecosystems. Under article 8(2), an operator would be strictly liable for, *inter alia*, “damage to the Antarctic environment or dependent or associated ecosystems arising from Antarctic mineral resource activities, including payment in the event that there has been no restoration to the status quo ante.”⁵²

49 Notwithstanding sovereignty claims “suspended” under article IV of the 1959 Antarctic Treaty.

50 See e.g. Christopher Joyner, *Governing the Frozen Commons: The Antarctic Regime and the Environmental Protocol* (Columbia, South Carolina: University of South Carolina Press, 1998) at 220–58.

51 1988 CRAMRA, *supra* note 48, art 4(2).

52 *Ibid*, art 8(2) [emphasis added].

CRAMRA has been replaced, in effect, by the 1991 Protocol on Environmental Protection to the Antarctic Treaty,⁵³ which prohibits mineral resource activities, other than scientific research.⁵⁴ In accordance with article 16 of the Protocol, in 2005, the parties adopted Annex VI,⁵⁵ which establishes a pared-back (compared to CRAMRA) liability regime applicable to environmental emergencies⁵⁶ that relate to scientific research programs, tourism and all other governmental and non-governmental activities in the Antarctic Treaty area for which advance notice is required under article VII(5) of the Antarctic Treaty in the Antarctic Treaty area. Each party must require its operators to undertake reasonable preventive measures that are designed to reduce the risk of environmental emergencies and their potential adverse impact,⁵⁷ and to take prompt and effective response action to environmental emergencies arising from the activities of that operator.⁵⁸ “Reasonable,” in relation to “preventative” measures and response action, means “measures or actions which are appropriate, practicable, proportionate and based on the availability of objective criteria and information, including: (i) risks to the Antarctic environment, and the rate of its natural recovery; (ii) risks to human life and safety; and (iii) technological and economic feasibility.” “Response action” means “reasonable measures taken after an environmental emergency has occurred to avoid, minimise or contain the impact of that environmental emergency, which to that end may include clean-up in appropriate circumstances, and includes determining the extent of that emergency and its impact.”⁵⁹ Where an operator does not take prompt and effective response action, then the (state) party of that operator and other parties are encouraged

53 *Protocol on Environmental Protection to the Antarctic Treaty*, 4 October 1991, 30 ILM 1461 [in force 14 January 1998] [*Antarctic Environment Protocol*].

54 *Ibid*, art 7; see also article 25(5) with respect to possible modification or amendment of article 7.

55 Antarctic Treaty Secretariat, *Final Report of the Twenty-Eighth Antarctic Treaty Consultative Meeting* (Buenos Aires: Antarctic Treaty Secretariat, 2005) at 61. Annex VI is not yet in force.

56 These are defined as “any accidental event that has occurred, having taken place after the entry into force of this Annex, and that results in, or imminently threatens to result in, any significant and harmful impact on the Antarctic environment” (*ibid*, Annex VI, art 2[b]).

57 *Ibid*, art 3(1).

58 *Ibid*, art 5(1).

59 *Ibid*, arts 2(e), (f).

to take such action,⁶⁰ and in such circumstances, the operator shall be liable to pay the costs of such a response action. Where prompt and effective response action is not taken, and no response action is taken by any party, article 6 makes provisions for payments to a fund established under article 12 of the Annex. The provisions on response measures in Annex VI seem limited in that they do not explicitly consider or address restoration.

Liability for Environmental Damage in the Work of Other International Institutions

Beyond the context of multilateral treaties, other bodies have addressed aspects of liability for environmental damage, including the definition and valuation of compensable damage.

The UNCC was established to deal with damage claims arising out of Iraq's invasion and occupation of Kuwait in 1990. In establishing the UNCC, the UN Security Council had already determined that Iraq "was liable under international law for any direct loss, damage, including environmental damage and the depletion of natural resources...as a result of [its] unlawful invasion and occupation of Kuwait."⁶¹ Thus, the context of the establishment and operation of the UNCC was evidently quite different from the development of a regime to govern liability arising out of activities in the Area. Essentially, the purpose of the UNCC was to administer verifiable claims. Nonetheless, it was recognized that addressing claims for environmental damage and depletion of natural resources would pose special challenges. In this context, the UNCC had to develop criteria and methods to address such claims, and it received numerous claims under this head of damage.⁶² As a first step, the UNCC Governing Council decided that compensation in respect of environmental damage or depletion of natural resources would include losses and expenses arising from:

- a) Abatement and prevention of environmental damage...;

- b) Reasonable measures already taken to clean and restore the environment or future measures which can be documented as reasonably necessary to clean and restore the environment;
- c) Reasonable monitoring and assessment of the environmental damage for the purpose of evaluating and abating the harm and restoring the environment;
- d) Reasonable monitoring of public health and performing medical screenings for the purposes of investigating and combating increased health risks as a result of the environmental damage; and
- e) Depletion of or damage to natural resources.⁶³

A panel of UNCC commissioners then examined and assessed the claims. The panel dealing with environmental damage and depletion of natural resources claims found that the criteria established by the Governing Council were not exhaustive,⁶⁴ and that the term "environmental damage" was not limited to damage to natural resources with a commercial value.⁶⁵ It also took the view that where loss or damage to the environment was temporary, this did not affect the question of compensability, although it might affect the nature and quantum of compensation deemed appropriate.⁶⁶ The panel found that there was "no justification for the contention that general international law precludes compensation for pure environmental damage."⁶⁷ It decided that where a resource had a commercial value and was damaged for a period of time, compensation should be awarded on the basis of the market price

60 *Ibid*, arts 5(2)-(5).

61 UN Security Council, *Resolution 687 Iraq-Kuwait*, UN Doc S/RES/687 (1991) at para 16.

62 On environmental and natural resources claims in the UNCC, see Michael T Huguenin et al, "Assessment and Valuation of Damage to the Environment" in Cymie Payne & Peter Sand, eds, *Gulf War Reparations and the UN Compensation Commission: Environmental Claims* (Oxford, UK: Oxford University Press, 2011) 67-94.

63 UNCC, *Criteria for Additional Categories of Claims*, Governing Council Dec 7, UN Doc S/AC.26/1991/7/Rev.1 (1992) at para 35 [UNCC, *Criteria*]. The Governing Council decision did not address valuation of compensation for such damage.

64 UNCC, *Report and Recommendations made by the Panel of Commissioners concerning the Second Instalment of "F4" Claims*, UN Doc S/AC.26/2002/26 (2002) at paras 22-23.

65 UNCC, *Report on the Fifth Instalment of "F4" Claims*, UN Doc S/AC.26/2005/10 (2005) at para 55 [UNCC, *Report on the Fifth Instalment*].

66 *Ibid* at para 56.

67 *Ibid* at para 58. The panel added that "[i]n particular, the Panel does not consider that the exclusion of compensation for pure environmental damage in some international conventions on civil liability and compensation is a valid basis for asserting that international law, in general, prohibits compensation for such damage in all cases, even where the damage results from an internationally wrongful act" [footnote omitted].

for the period of time that the damage persisted, adjusted as appropriate to take into account the influence of other sources of damage.⁶⁸ For damage to resources that did not have a market reference price, the UNCC panel indicated that it would be willing to compensate natural resource losses by reference to the costs of other environmental projects that were put in place to compensate for the loss of ecological services that the natural resources would have provided had they not been damaged, so long as there was “sufficient evidence that primary restoration will not fully compensate for any identified losses.”⁶⁹ Thus, the emphasis was on primary remediation and restoration of services, but there appears to have been recognition that compensation for other restoration activities would be available where primary restoration was not possible or where there were interim losses.⁷⁰ Some claimants used “habitat equivalency analysis” (HEA) to determine the amount of compensation claimed, which involves assessing the nature and extent of the temporary loss of ecological services from the damaged resources, determining the gain in ecological services anticipated from the compensatory projects and calculating the cost of the compensatory projects. In considering approaches to valuation of damage, the panel expressed the view that “international law does not prescribe any specific and exclusive methods of measurement for awards of damages for internationally wrongful acts by states. The general rule is to restore what has been damaged to integrity or, if this is not possible, to provide an equivalent for it.”⁷¹ The panel recognized that:

there are inherent difficulties in attempting to place a monetary value on damaged natural resources, particularly resources that are not traded in the market. With specific regard to HEA, the Panel recognizes that it is a relatively novel methodology, and that it has had limited application at the national and international levels. The Panel is also aware that there are uncertainties in HEA calculations, especially for establishing a metric that appropriately accounts for different types of service losses and

for determining the nature and scale of compensatory restoration measures that are appropriate for damage to particular resources. For these reasons, the Panel considers that claims presented on the basis of HEA or similar methodologies of resource valuation should be accepted only after the Panel has satisfied itself that the extent of damage and the quantification of compensation claimed are appropriate and reasonable in the circumstances of each claim. However, the Panel does not consider that these potential difficulties are a sufficient reason for a wholesale rejection of these methodologies, or for concluding that their use is contrary to international law principles.⁷²

In addressing compensation claims in respect of “reasonable monitoring and assessment of environmental damage for the purpose of evaluating and abating the harm and restoring the environment,”⁷³ the UNCC found that environmental monitoring and assessment were justified even where it was not yet firmly established that environmental damage had occurred. Conclusive proof of environmental damage was not a prerequisite for a monitoring and assessment activity to be compensable.⁷⁴ However, the panel did not award compensation for monitoring and assessment activities that were “purely theoretical and speculative.”⁷⁵

While the work of the UNCC addressed damage arising out of the wrongful act of a state, its approach to the definition and valuation of environmental damage may have wider significance.

The ILC has also opined on compensation for environmental damage in its work on the allocation of loss in the case of transboundary harm arising out of hazardous activities. The ILC has identified as elements of “damage”: “loss or damage by impairment of the environment”; “the costs of reasonable measures of reinstatement of...the environment, including natural resources”; and

68 *Ibid* at paras 103–18.

69 *Ibid* at para 82.

70 José R Allen, “Points of Law” in Payne & Sand, *supra* note 62 at 167.

71 UNCC, *Report on the Fifth Instalment*, *supra* note 65 at para 80.

72 *Ibid* at para 81.

73 UNCC, *Criteria*, *supra* note 63 at para 35(c).

74 UNCC, *Report of the First Instalment of “F4” Claims*, S/AC.26/2001/16 (2001) at paras 29–30.

75 *Ibid* at para 31.

“the costs of reasonable response measures.”⁷⁶ These appear to reflect the approach taken in several of the civil liability instruments surveyed above. Principle 3(b) of the Draft Principles on the Allocation of Loss provides that the purpose of the draft principles include “to preserve and protect the environment in the event of transboundary damage, especially with respect to mitigation of damage to the environment and its restoration or reinstatement.” In the Commentary, the ILC notes that Draft Principle 3(b) gives:

a prominent place to the protection and preservation of the environment and to the associated obligations to mitigate the damage and to restore or reinstate the same to its original condition to the extent possible. Thus it emphasizes the more recent concern of the international community to recognize protection of the environment *per se* as a value by itself without having to be seen only in the context of damage to persons and property. It reflects the policy to preserve the environment as a valuable resource not only for the benefit of the present generation but also for future generations. In view of its novelty and the common interest in its protection, it is important to emphasize that damage to the environment *per se* could constitute damage subject to prompt and adequate compensation, which includes reimbursement of reasonable costs of response and restoration and remediation measures undertaken.⁷⁷

Draft Principle 2 defines “damage” in the following terms:

“damage” means significant damage caused to persons, property or the environment; and includes:

- i) loss of life or personal injury;

- ii) loss of, or damage to, property, including property which forms part of the cultural heritage;
- iii) loss or damage by impairment of the environment;
- iv) the costs of reasonable measures of reinstatement of the property, or environment, including natural resources;
- v) the costs of reasonable response measures.

“Environment” for the purpose of the Draft Articles includes natural resources, both abiotic and biotic, such as air, water, soil, fauna and flora and the interaction between these factors, and the characteristic aspects of the landscape.

In its Commentary to Draft Principle 2, the ILC observed that:

Recent trends are also encouraging in allowing compensation for loss of “non-use value” of the environment. There is some support for this claim from the [International Law] Commission itself when it adopted its draft articles on State responsibility, even though it is admitted that such damage is difficult to quantify. The recent decisions of the United Nations Compensation Commission (UNCC) in opting for a broad interpretation of the term “environmental damage” is a pointer of developments to come. In the case of F-4 category of environmental and public health claims, the F-4 Panel of the UNCC allowed claims for compensation for damage to natural resources without commercial value (so-called “pure” environmental damage) and also claims where there was only a temporary loss of resource use during the period prior to full restoration.⁷⁸

In its work on state responsibility, the ILC has commented that “environmental damage will often extend beyond that which can be readily quantified in terms of clean-up costs or property devaluation. Damage to such environmental values (biodiversity, amenity, etc.—sometimes referred to as “non-use values”) is, as a matter of principle,

⁷⁶ ILC, *Draft Principles on the Allocation of Loss in the Case of Transboundary Harm Arising out of Hazardous Activities, with Commentaries*, YB ILC, vol 2, Part 2 (2006) [ILC, *Draft Principles*]; UN General Assembly, *Resolution adopted by the General Assembly on 4 December 2006: Allocation of loss in the case of transboundary harm arising out of hazardous activities*, GA Res 61/36, UNGAOR, 61st Sess, UN Doc A/RES/61/36 (2006).

⁷⁷ ILC, *Draft Principles*, *supra* note 76, Commentary at para 6.

⁷⁸ *Ibid* at para 18 [footnotes omitted].

no less real and compensable than damage to property, though it may be difficult to quantify.”⁷⁹

In 2018, the ICJ addressed compensation for environmental damage in a case concerning damage to wetlands. The ICJ affirmed that “it is consistent with the principles of international law governing the consequences of internationally wrongful acts, including the principle of full reparation, to hold that compensation is due for damage caused to the environment in and of itself, in addition to expenses incurred by an injured state as a consequence of such damage.”⁸⁰ In this case, the ICJ took the view that “damage to the environment, and the consequent impairment or loss of the ability of the environment to provide goods and services, is compensable under international law” and that “[s]uch compensation may include indemnification for the impairment or loss of environmental goods and services in the period prior to recovery and payment for the restoration of the damaged environment.”⁸¹ The court acknowledged that issues may arise as to the existence of damage and causation in cases of alleged environmental damage. The court also noted in respect of valuation of such damage that the absence of adequate evidence as to the extent of material damage would not, in all situations, preclude an award of compensation for that damage.⁸² The ICJ observed that international law does not prescribe any specific method of valuation for the purposes of compensation for environmental damage and that it was necessary to take into account the specific circumstances and characteristics of each case.⁸³ In the face of competing valuation methodologies put forward by the parties, the court’s approach to the determination of compensation of environmental damage in this case was to assess the value to be assigned to the restoration of the damaged environment as well as to the impairment or loss of environmental goods and services prior to

recovery.⁸⁴ Further, in the circumstances of the case, the court considered it appropriate to approach the valuation of environmental damage from the perspective of the ecosystem as a whole by adopting an overall assessment of the impairment of loss of environmental goods and services prior to recovery, rather than attributing values to specific categories of environmental goods and services and estimating recovery periods for each of them.⁸⁵ In an earlier case not involving environmental damage, the court observed that quantification of compensation for non-material injury rests on equitable considerations and awarded compensation on this basis.⁸⁶

The wide range of instruments and processes surveyed above demonstrate a variety of approaches to questions of the definition and valuation of environmental harm. Nonetheless, they appear to suggest growing recognition of the need to provide for forms of compensation for loss of environmental resources and services, including through restoration, and other measures such as the introduction of equivalent resources where primary restoration is not possible or results in interim losses. Different contexts give rise to different challenges in relation to assessing and implementing appropriate restoration and compensatory measures.

Deep Seabed Mining and Environmental Damage

If a liability regime is developed for environmental harm arising from activities in the Area, a number of issues arise relating to the features and legal character of the Area, its resources and the marine environment of the Area, as well as the relation of any liability regime to the rules and approaches in the convention, the 1994 Agreement and ISA Regulations. This section attempts a preliminary identification and consideration of some of these issues.

79 ILC, *Draft Articles on Responsibility of States for Internationally Wrongful Acts, with Commentaries*, YB ILC, vol 2, Part 2 (2001), Commentary to art 36 at para 15.

80 *Certain Activities Carried Out by Nicaragua in the Border Area (Costa Rica v Nicaragua) Compensation owed by the Republic of Nicaragua to the Republic of Costa Rica* (2018), at para 41.

81 *Ibid* at para 42.

82 *Ibid* at paras 34–35; see also para 86.

83 *Ibid* at para 52.

84 *Ibid* at para 53

85 *Ibid* at para 78.

86 *Ahmadou Sadio Diallo (Republic of Guinea v Democratic Republic of Congo)* (2012), compensation owed by the Democratic Republic of Congo to the Republic of Guinea, at para 24.

The Legal Framework: The LOSC and Related Instruments

The provisions of Part XII of the LOSC impose obligations on parties to protect and preserve the marine environment.⁸⁷ Part XI of the LOSC addresses protection of the marine environment from harmful effects that may arise from activities in the Area. Article 145 provides that necessary measures shall be taken in accordance with the convention with respect to activities in the Area to ensure effective protection for the marine environment from harmful effects that may arise from such activities. The ISA is to adopt appropriate rules, regulations and procedures to this end. Article 162(2)(x) provides that the Council shall “disapprove areas for exploitation by contractors or the Enterprise in cases where substantial evidence indicates the risk of serious harm to the marine environment.” Article 162(2)(w) also requires the Council to issue emergency orders, which may include orders for the suspension or adjustment of operations, to prevent serious harm to the marine environment arising out of activities in the Area. Article 165(2)(k) and (l) impose corresponding obligations on the Legal and Technical Commission to make recommendations to the Council in this regard. The ISA has taken up the requirement to establish international rules, regulations and procedures in the Mining Code, including the three sets of Exploration Regulations,⁸⁸ and the ongoing process to develop Exploitation Regulations.⁸⁹

While the emphasis is on protection of the marine environment from harmful effects arising from activities in the Area, Part XI and Annex III also address responsibility and liability for damage in relation to such activities. Article 139(2) provides that damage caused by the failure of a state party or international organization to carry out its responsibilities under Part XI shall entail liability. However, it specifies that a state party shall not be liable for damage caused by any failure to comply with Part XI by a person whom it has sponsored under article 153(2)(b) if the state

party has taken all necessary and appropriate measures to secure effective compliance. Article 22 of Annex III provides that “the contractor shall have responsibility or liability for any damage arising out of wrongful acts in the conduct of its operations, account being taken of contributory acts or omissions of the Authority. Similarly, the Authority shall have responsibility or liability for any damage arising out of wrongful acts in the exercise of its powers and functions...account being taken of contributory acts or omissions by the contractor. Liability in every case shall be for the actual amount of damage.”⁹⁰

Annex III and Part XI do not further elucidate responsibility and/or liability of the ISA, states parties, sponsoring states or contractors. Neither do they clarify what types of damage might arise and how the “actual amount of damage” might be defined or quantified. Aspects of responsibility and liability have also been addressed in the Exploration Regulations, including the standard clauses for exploration contracts.⁹¹

The SDC clarified some aspects of the liability issues raised in Part XI and Annex III in its 2011 Advisory Opinion.⁹² In considering article 139(2), the SDC noted that “[n]either the Convention nor the relevant Regulations (regulation 30 of the Nodules Regulations and regulation 32 of the Sulphides Regulations) specifies what constitutes compensable damage, or which subjects may be entitled to claim compensation. It may be envisaged that the damage in question would include damage to the Area and its resources constituting the common heritage of mankind, and damage to the marine environment.”⁹³

The SDC also addressed the amount and form of compensation, by reference to Annex III, article 22. Here, the SDC was of the view that the provisions concerning liability of the contractor for the actual amount of damage under Annex III, article 22, were equally valid with regard to the liability of the sponsoring state.⁹⁴ The SDC suggested that “the form of reparation will depend on both the actual damage and the technical feasibility of restoring the situation

⁸⁷ See in particular arts 192, 194, 209.

⁸⁸ ISA, *Regulations on Prospecting and Exploration for Polymetallic Nodules in the Area, updated and amended*, ISBA/19/C/17 [2013] [Nodules Regulations]; ISA, *Regulations on Prospecting and Exploration for Polymetallic Sulphides in the Area*, ISBA/16/A/12/Rev.1 [2010]; ISA, *Regulations on Prospecting and Exploration for Cobalt-rich Ferromanganese Crusts in the Area*, ISBA/18/A/11 [2012].

⁸⁹ ISA, *Draft Regulations on Exploitation of Mineral Resources in the Area*, ISBA/24/LTC/WP.1/Rev.1 [2018] [Draft Exploitation Regulations].

⁹⁰ LOSC, *supra* note 1, Annex III, art 22, Basic Conditions of Prospecting, Exploration and Exploitation.

⁹¹ For example, *Nodules Regulations*, *supra* note 88, Reg 30, Annex 4, Standard Clauses for Exploration Contract, s 16.

⁹² SDC Advisory Opinion 2011, *supra* note 2.

⁹³ *Ibid* at para 179.

⁹⁴ *Ibid* at para 195.

to the *status quo ante*.⁹⁵ In light of the approaches in other agreements discussed above, the reference to restoration here is of note. However, a number of questions remain unanswered relating to a potential liability regime for seabed mining activities in the Area, including how “damage to the Area and its resources” and “damage to the marine environment” might be defined; and how compensable damage might be assessed and quantified or valued for the purposes of compensation — in the words of Annex III, article 22, what is the “actual amount of damage” in this context?

Nature and Approach of the Liability Regime

As shown above, existing liability agreements and processes have taken different approaches to what constitutes compensable environmental damage. Drawing upon the examples surveyed in this paper, approaches to compensation for damage to the marine environment might encompass:

- loss or damage by impairment of the marine environment (“loss of profit” claims);
- the costs of reasonable measures of restoration or reinstatement of the marine environment, including natural resources;
- reasonable measures to introduce the equivalent of destroyed or damaged components of the marine environment;
- reasonable costs of assessing and monitoring impairment of the marine environment;
- the costs of reasonable preventive or response measures; and/or
- other compensatory response measures.

Several examples discussed in this paper relate to civil liability regimes, in respect of activities that pose risks to the environment, that establish rules and procedures for the recovery of monetary compensation for losses incurred. Other examples focus more on mechanisms for preventing and minimizing environmental damage, and restoring the environment, as

well as compensating environmental loss that cannot be remediated or restored.⁹⁶

Nature and Location of Potential Impacts

Deep seabed mining activities will have impacts on the marine environment. Such impacts may vary in effect and intensity, according to the type of mining activity involved, but may include, for example, direct habitat destruction, elimination of local biodiversity, and degradation of surrounding environments through indirect impacts such as sediment plumes, noise and vibration from pumps, platforms and vessels, and light.⁹⁷ The provisions of the LOSC and the Exploration Regulations, as well the SDC Advisory Opinion, establish a clear duty on the part of the ISA, sponsoring states and contractors to protect the marine environment from damage associated with activities in the Area. In particular, articles 139 and 145 underscore this duty on the part of the ISA and parties to the convention. Potential impacts of mining activities should therefore be identified and assessed, and risks addressed, before a mining activity is authorized. The precautionary approach should also be applied.⁹⁸

Impacts might occur in and on the seabed within the Area, affecting the Area and its resources, but could also affect the water column above the Area and, in certain circumstances, potentially the seabed and water column in areas under the national jurisdiction of a coastal state. Types of damage may include:

- damage to persons and property occurring as a result of seabed mining activities in the Area, including loss arising as a result of environmental damage caused by seabed mining activities;

96 On these approaches, see *Addressing serious harm to the marine environment in the regulations for the exploitation of mineral resources in the Area*, submitted by the delegation of the Netherlands, ISBA/21/C/13 (2015). See also, for example, *Nagoya-Kuala Lumpur Protocol*, *supra* note 40; *Antarctic Environment Protocol*, *supra* note 53, Annex VI, discussed above.

97 Daniel C Dunn et al, “A strategy for the conservation of biodiversity on mid-ocean ridges from deep-sea mining” (2018) 4:7 *Science Advances* at 2; Lisa A Levin et al, “Defining ‘serious harm’ to the marine environment in the context of deep-seabed mining” (2016) 74 *Marine Policy* 245 at 250–55.

98 SDC Advisory Opinion 2011, *supra* note 2 at paras 125–35; *Draft Exploitation Regulations*, *supra* note 89, *Draft Regulations* 2(5)(b), 14(2), 46(a).

95 *Ibid* at para 197.

- damage to the marine environment of the Area, including damage to living resources of the Area;
- damage to the Area and its resources constituting the CHM;
- damage to living resources in the water column above the Area (i.e., in the high seas);⁹⁹ and
- damage to the marine environment and natural resources outside the Area (i.e., in areas under national jurisdiction).¹⁰⁰

The extent to which these and/or other heads of damage are compensable will depend, in part, on the scope of the regime to be established. For example, would the regime only address impacts of mining activities on the Area and the marine environment of the Area itself, or would its scope extend to impacts of deep seabed mining activities on the high seas and high seas resources and on areas and resources within national jurisdiction? While the latter approach seems more appropriate and compatible with the definition of marine environment contained in the Draft Exploitation Regulations (see below), how would such a regime relate to other rules and instruments applicable in those maritime zones?¹⁰¹

Each of the potential categories of damage mentioned above raises complex issues of definition, assessment and valuation. In its Advisory Opinion, the SDC observed that while neither the convention nor the relevant Exploration Regulations specify what constitutes compensable damage, “[i]t may be envisaged that the damage in question would include damage to the Area and its resources

constituting the common heritage of mankind, and damage to the marine environment.”¹⁰²

Damage to the Marine Environment

The Draft Exploitation Regulations define the “[m]arine [e]nvironment” as including “the physical, chemical, geological and biological and genetic components, conditions and factors which interact and determine the productivity, state, condition and quality and connectivity of the marine ecosystem(s), the waters of the seas and oceans and the airspace above those waters, as well as the seabed and ocean floor and subsoil thereof.”¹⁰³

Given the status of scientific knowledge about the marine environment of the Area, gaps in baseline data and concerns about the potential for irreversible damage, there may be significant challenges associated with assessing this category of loss. Lisa Levin et al. suggest that “[i]n reality, assessing any changes to deep-sea ecosystems induced by mining activities is challenging at best.”¹⁰⁴ They suggest the existence of major knowledge gaps and the lack of baseline information.¹⁰⁵ While the definition of marine environment in the Exploitation Regulations is designed to capture the various components and the complexity of the marine ecosystem, that complexity seems likely to present significant challenges in terms of the assessment and possible restoration or reinstatement of components of the environment.

The nature of impacts of seabed mining activities on the marine environment may render restoration or reinstatement of the environment unfeasible.¹⁰⁶ As the SDC noted in its Advisory Opinion, “the form of reparation will depend on both the actual damage and the technical feasibility of restoring the situation to the *status quo ante*.”¹⁰⁷ As discussed above, there are precedents in international law, where restoration or reinstatement is not feasible, to make provision

⁹⁹ For example, depending upon the nature of living resources affected, if such damage is covered, it might conceivably include loss of profit from impairment to the marine environment, as well as claims relating to damage to the marine environment as such, involving assessment of preventive measures, reasonable measures of reinstatement, assessment and monitoring, and potentially pure environmental damage. If the definition of the marine environment in the Draft Exploitation Regulations is adopted and were to be integrated into any liability regime, then living resources of the water column above the Area would be included within the scope of the rules and procedures on liability.

¹⁰⁰ Article 142 of the LOSC addresses the rights and legitimate interests of coastal states; for example, Regulation 34 of the Nodules Regulations addresses rights of coastal states, including the avoidance of serious harm to the marine environment of a coastal state.

¹⁰¹ This would seem to necessitate further consideration in due course of the relationship between the deep seabed mining regime established by the ISA and any new instrument that may be adopted addressing marine biological diversity of areas beyond national jurisdiction.

¹⁰² SDC Advisory Opinion 2011, *supra* note 2 at para 179.

¹⁰³ *Draft Exploitation Regulations*, *supra* note 89, Schedule 1, Use of Terms and Scope.

¹⁰⁴ Levin et al, *supra* note 97 at 248.

¹⁰⁵ *Ibid* at 248–49.

¹⁰⁶ See e.g. Cindy Lee Van Dover et al, “Biodiversity Loss from Deep-Sea Mining” (2017) 10:7 *Nature Geoscience* 464–65.

¹⁰⁷ SDC Advisory Opinion 2011, *supra* note 2 at para 197.

in a liability regime for introduction of equivalent components of biodiversity at the same or an alternative location. However, it may be that this approach is not possible or may not fully offset damage to the marine environment in the Area. The identification and “threshold” of cumulative impacts on the marine environment may also need to be considered and may be particularly challenging to identify and address.

Where adequate measures of reinstatement or restoration or introduction of equivalents cannot be put in place, consideration should be given to other ways of compensating damage to the marine environment, in particular given the status of the Area as the CHM.

Damage to the Area and Its Resources Constituting the CHM

The statement of the SDC that “[i]t may be envisaged that the damage in question would include damage to the Area and its resources constituting the common heritage of mankind, and damage to the marine environment” suggests that these can be treated as separate categories of damage. In some respects, however, it may be difficult to separate them. Damage to or depletion of natural resources may be viewed as a distinct head of damage under a liability regime, as, for example, in the work of the UNCC discussed above. In that sense, if mineral resources are lost or damaged as a result of activities in the Area, it may be possible to ascribe economic value to them on the basis of some form of commercial valuation. At the same time, the Area and its mineral resources constitute part of the marine environment of the Area, at least under the terms of the definition contained in the Draft Exploitation Regulations (see above). In that sense, damage to the resources of the Area also implies damage to a component of the seabed environment.

Even as a separate category of damage, the status of the Area and its resources as the CHM raises challenges for defining and valuing compensable damage. Damage to the CHM may imply the need to consider not only the economic value of lost or damaged resources but other values associated with its designation as the CHM.

Genetic Resources

In keeping with contemporary understandings of biodiversity, the definition of marine environment in the Draft Exploitation Regulations includes a reference to genetic components of the marine ecosystem. The legal status of genetic resources in the Area is not settled and may be subject to further discussion in 2019 and beyond in the context of the negotiation of an international legally binding instrument on the conservation and sustainable use of marine biological diversity in areas beyond national jurisdiction.¹⁰⁸ For the purposes of defining categories of environmental damage, marine genetic resources might be viewed as components of the marine environment and/or as natural resources of actual or potential commercial value. The implications of the ongoing negotiations on marine biodiversity of the Area for any liability regime for activities in the Area will need to be kept under review.

Threshold of Harm

Article 162 provides that areas should be disapproved for exploitation where there is substantial evidence of a risk of “serious harm” to the marine environment. Emergency orders may also be issued, including for suspension or adjustment of operations and for other response measures to prevent serious harm to the marine environment.¹⁰⁹

On this basis, should serious harm be the threshold at which liability for compensable damage to the marine environment would arise? As compared to other areas of international law, and in particular, in light of developments in international environmental law since the adoption of the LOSC in 1982, *prima facie* the use of the term serious harm seems to impose an unreasonably high threshold before liability for harm is triggered. The August 2018 Draft Exploitation Regulations define serious harm as “any effect from activities in the Area on the Marine Environment which represents a significant adverse change in the Marine Environment determined according to the rules, regulations and procedures adopted by the Authority on the basis of internationally recognized standards and practices informed

¹⁰⁸ UN General Assembly, *Resolution adopted by the General Assembly on 24 December 2017, UNGAOR, 72nd Sess, A/RES/72/249* (2017).

¹⁰⁹ LOSC, *supra* note 1, art 162(2)(w); see e.g. *Nodules Regulations, supra* note 88, art 33.

by Best Available Scientific Evidence.”¹¹⁰ “Environmental [e]ffects” are defined as “any consequences in the Marine Environment arising from the conduct of Exploitation activities, being positive, negative, direct, indirect, temporary or permanent, or cumulative effect arising over time or in combination with other mining impacts.”¹¹¹

The implication of these definitions for any liability regime, and their linkage with it, requires further consideration. The definition appears to imply that ways of determining “significant adverse change” would be adopted by the ISA, and it may be appropriate to develop criteria or guidance for assessing the existence, nature and scale of such change, taking into account the precautionary approach. Levin et al. have examined the definition of serious harm and sought to identify key parameters to inform decisions about whether an impact constitutes a serious harm. They consider, *inter alia*, the definition of “significant adverse impact” adopted under the Food and Agriculture Organization of the United Nations (FAO) international guidelines on deep-sea bottom fishing,¹¹² and in the seabed mining context, suggest also taking into account the cumulative effects of impacts, the probability of impacts occurring and scientific uncertainty.¹¹³ Work under other agreements, such as the Convention on Biological Diversity, may also be relevant in this context.

Conclusion

If the ISA decides to develop more specific rules and procedures on liability for damage to the Area and its resources, including damage to the marine environment, there are numerous examples of liability regimes in other areas of international law that might provide useful models or examples for consideration and/or adaptation. It is important

to note, however, that, with the exception of the oil pollution regime, practical experience in the application of the numerous civil liability regimes is limited, often because the regimes have not entered into force. The instruments and processes surveyed above do not reflect a fully harmonized approach to questions of definition of environmental damage. However, they illustrate a growing acceptance that environmental damage should be compensated, even in circumstances where the assessment and quantification of such damage is challenging and, increasingly, that compensation or compensatory measures should be available where restoration of the damaged environment is not feasible or where measures taken to restore the damaged environment nonetheless result in interim loss. The wider context of both international environmental law and the relevant provisions of the LOSC place the emphasis on the prevention of environmental harm and, in particular in light of the SDC Advisory Opinion, on the precautionary approach.

The characteristics and legal character of the Area mean that a tailored approach will be required that takes into account the existing legal framework under Parts XI and XII of the LOSC and the guidance of the SDC in its Advisory Opinion. At a minimum, the definition of compensable damage in any such regime needs to accommodate the particular features of the marine environment of the Area and the status of the Area and its resources as part of the CHM. The definition also needs to take into account the state of scientific knowledge in relation to deep sea ecosystems. Particular issues to be considered may include:

- the relation with existing provisions and guidance relating to protection of the marine environment and liability under the provisions of the convention, the Mining Code and the SDC Advisory Opinion;
- the need to ensure protection of the marine environment from harmful effects that may arise from activities in the Area, reflecting the precautionary approach;
- potential difficulties associated with implementing existing approaches to restoration and introduction of equivalents in the context of the marine environment of the deep seabed, including, for example, the state of scientific knowledge and scientific uncertainty, the accessibility of deep seabed ecosystems and the potential for irreparable harm; and

¹¹⁰ *Draft Exploitation Regulations*, *supra* note 89, Schedule 1, Use of Terms and Scope.

¹¹¹ *Ibid.*

¹¹² FAO, *International Guidelines for the Management of Deep-sea Fisheries in the High Seas* (Rome: FAO, 2009), online: <www.fao.org/in-action/vulnerable-marine-ecosystems/background/deep-sea-guidelines/en/>. The guidelines aim to ensure conservation and sustainable use of marine living resources in the deep seas and to prevent significant adverse impacts on vulnerable marine ecosystems.

¹¹³ Levin et al, *supra* note 97 at 248.

→ the need for monitoring and assessment of damage to the marine environment, including cumulative and long-term impacts.

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