A Sustainable Seabed Mining Asset Valuation Code Framework

By

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Dedication

This thesis is dedicated to the following:

- My Parents, Karen and Edward MacMaster, for their unlimited support, love and patience throughout this process. I love you both.

- My Sister, Angela MacMaster and her partner, Michael Richards, for their support and love and for not allowing me to quit.

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Abstract

Seabed mining is governed by the *United Nations Convention on the Law of the Sea, the Agreement relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982,* the Mining Code, domestic laws of member states, and international law. The central tenets of seabed mining law are to develop the industry in accordance with the Common Heritage of Mankind, provide equitable sharing of financial and economic benefits derived from seabed mining activities, and protect and preserve the marine environment. Moreover, seabed mining must be developed and operated to not unduly financially harm land-based mining operations, nor should seabed mining operate at a competitive disadvantage. The International Seabed Authority ("ISA") regulates mining in the Area, defined as the ocean area beyond national jurisdiction.

Land-based mineral valuation codes help value minerals fairly, consistently and accurately and provide for the public disclosure of this information to investors. Securities regulators in Canada, the United States, Australia, and several other jurisdictions require valuations based on these mineral asset valuation codes. However, terrestrial mineral valuation code research shows gaps in incorporating environmental, social, and governance factors into financial valuations. The ISA has recommendations on mineral reserves but has not undertaken the work to transform these recommendations into a valuation code. Seabed mining contractors do not need to disclose financial information to the public. This thesis thus answers the following questions:

- How might the legal framework for deep-seabed mining finance in the international seabed area be envisioned to enable an environmentally and socially sustainable industry for the low-carbon world?
- How does the law shape the financing of seabed mining such that a mineral asset valuation code could be developed to assist contractors with the sustainable exploitation of minerals found on the seabed?

This dissertation recommends the ISA develop a sustainable seabed mining asset valuation code, incorporating environmental and social factors into financial valuations. Sustainable development law informs which environmental and social factors to include in such a code. This seabed mining valuation code could apply to all contractors and mining operators, regardless of how they are formed, owned or legally structured.

The dissertation develops ten (10) 'principles' that must be addressed in such a seabed valuation code. These principles include the necessity of valuing equitable sharing and the common heritage of mankind, valuing seabed minerals and cash flows more accurately, valuing nature and the circular economy, valuing social equality, publicly disclosing valuations, standardizing valuations to avoid regulatory capture, integrating valuations into all financial arrangements, ensuring data requirements are sufficient, allowing regional approaches, and revising terrestrial mining codes to integrate environmental and social valuations better. This code would ensure that mineral valuations are accurate, consistent and comparable with their land-based mining counterparts.

List of Abbreviations Used

Agreement relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982 – *1994 Agreement*
Australasian Code for Public Reporting of Technical Assessments and Valuations of Mineral Assets – VALMIN
Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves - JORC Code
Canadian Code for the Valuation of Mineral Properties - CIMVAL
Capital asset pricing model for nature - CAPn
Clarion-Clipperton Fracture Zone - CCZ
Committee for Reserves International Reporting Standards - CRIRSCO
Convention on Biological Diversity - CBD
Draft Regulations on Exploitation of Mineral Resources in the Area – Draft Exploitation Regulations
Environmental Performance Guarantee - Guarantee
Environmental and Social Impact Assessment - ESIA
Environmental Impact Assessment – EIA or EA
Impact Assessment - IA
International Law Commission – ILC
International Mineral Valuation Committee - IMVAL
International Seabed Authority – ISA
International Tribunal of the Law of the Sea - ITLOS
Interoceanmetal Joint Organization - IOM
Japan Oil, Gas and Metals National Corporation - JOGMEC
Legal and Technical Commission - LTC
Materials Systems Laboratory at the Massachusetts Institute of Technology - MIT
National Instrument 43-101, Standards of Disclosure for Mineral Projects - NI 43-101
Nauru Ocean Resources Inc. - NORI
Pistor's Legal Theory of Finance - LTF
Preparatory Commission for the International Seabed Authority and the International Tribunal for the Law of the Sea - PrepCom
Reporting Standard for Reporting of Mineral Exploration Results Assessments, Mineral Resources and Mineral Reserves – ISA Reporting Standard
Responsibilities and Obligations of States Sponsoring Persons and Entities with Respect to Activities in the Area - Seabed Advisory Opinion or Case 17
Seabed Dispute Chamber – SDC
Standard Instructions for Filing Forms Under Securities Act of 1933, Securities Exchange Act of 1934 and Energy Policy and Conservation Act of 1975 - Regulation S-K [17 CFR 229] Subpart 1300 – Regulation S-K
Society for Mining, Metallurgy, and Exploration, Inc. - SME
Sustainable Development Goals - SDGs
Taskforce for Climate-Related Financial Disclosures - TCFD
TMC the Metals Company Inc. – TMC
Tonga Offshore Mining Limited – TOML
Toronto Stock Exchange - TSX
Towards Sustainable Mining - TSM
United Nations Convention on the Law of the Sea – UNCLOS

United Nations Decade of Ocean Science for Sustainable Development (2021–2030) – Ocean Decade
United Nations Environment Programme - UNEP

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Chapter 1 - Introduction

A battery in a rock[1]

The seabed, also called the seafloor, is the solid ocean floor.[2] Parts of the seabed are thought to contain vast quantities of minerals, such as lithium, cobalt, manganese, nickel, copper, and rare earth minerals.[3] Seabed mining may solve a potential decline in terrestrial mineral resources, assist in transitioning from a fossil-fuel-based to a low-carbon economy, and allow developing countries to benefit from resource extraction as a route to economic development.[4]

The story of seabed mining is complex. There are legal issues (domestic and international), technical, financial, economic, political, environmental and social. Telling this story compellingly and understandably is a challenge. The legal issues are complex. There are unique actors and participants, including States, corporations, State Enterprises, international organizations, and non-profit organizations. As described in more detail in the body of the dissertation, seabed mining must be developed alongside land-based mining to not create an artificial advantage or disadvantage to either operation.

The financing of seabed mining is advancing rapidly, yet little research has been conducted on seabed mining finance law. There have been some major developments in the last few years and the near readiness of the framework, technology and regulations for the exploitation of seabed mining.[5] The work by the international regulator does not incorporate

[1] DeepGreen, "Deep Sea Mining Battery Metals" online: https://deep.green/
[2] Arthur Braathen & Harold Brekke, "Characterizing the Seabed: a Geoscience Perspective" in Banet, Catherine, ed, *Law of the Seabed* (Leiden/Boston: Brill, 2020) at 21.
[3] Michael Lodge, "The International Seabed Authority and Deep Seabed Mining" (2017) 54:1/2 UN Chronicle 44–46; Marcel Rozemeijer et al, "Seabed Mining" in Kate Johnson & Gordon Dalton, eds, *Blue Growth and the New Maritime Economy* (The Netherlands: River Publishers, 2018) at 75–76.
[4] Luz Bolong, "Into the abyss: rationalizing commercial deep seabed mining though pragmatism and international law" (2016) 25:1 Tulane JICL 181 at 134–135, 140.
[5] ISA, "The Mining Code: Standards and Guidelines" online: https://www.isa.org.jm/mining-code/standards-and-guidelines; SEC, "EDGAR: TMC" online: https://www.sec.gov/edgar/browse/?CIK=1798562&owner=exclude.

environmental or social factors into financial frameworks.[6] No work has been conducted on asset valuation codes and seabed mining. This dissertation fills a gap in the research to recommend an environmentally and socially sustainable method to value minerals.

1.0 The Law of the Sea and Seabed Mining

Seabed mining is governed by the *United Nations Convention on the Law of the Sea*, the *Agreement relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982,* the *Mining Code* (defined below), domestic laws of Member States, and international law.[7] Seabed mining in the Area, defined as the ocean area beyond national jurisdiction, is regulated by the International Seabed Authority ("ISA").[8]

One of the central tenets of seabed mining is to develop the industry in accordance with the Common Heritage of Mankind and provide equitable sharing of financial and other economic benefits derived from seabed mining activities.[9] Seabed mining must be developed not unduly to harm land-based mining operations.[10] The law of the sea provides for the protection and preservation of the marine environment.[11] This protection includes recourse for compensation for damage caused to the marine environment.[12] This sub-section briefly reviews several key issues in seabed mining.[13]

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[6] For example, see the Kirchain/MIT studies, Chapter 5, *infra*.
[7] *United Nations Convention on the Law of the Sea 1833 UN Treaty Series 397*, 1982; *Agreement relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982*, 1994; ISA, "The mining code", online: https://www.isa.org.jm/mining-code.
[8] *UNCLOS*, *supra* note 7 at Articles 156, 157.
[9] *Ibid* at Articles 136, 140(2); Aline Jaeckel, Kristina M Gjerde & Jeff A Ardron, "Conserving the common heritage of humankind – Options for the deep-seabed mining regime" (2017) 78:C Marine Policy 150–157.
[10] *UNCLOS*, *supra* note 7 at Annex III, Article 13; *1994 Agreement*, *supra* note 7 at Annex, Section 8.
[11] *UNCLOS*, *supra* note 7 at Articles 145, 208, 209, 215, 235.
[12] *Ibid* at Article 235(2).
[13] Comprehensive reviews are conducted in Chapters 2, 3 and 6.

1.0.1 Common Heritage, Social Issues and the Mining Industry

Mining activities typically cause impacts on land, water, the climate, dust, particulate matter, other atmospheric issues, and the flora, fauna and people affected by their development. The Common Heritage of Mankind principle was developed to ensure that developing States can meaningfully and fully participate in exploring and exploiting deep seabed minerals.[14] It is about benefit sharing. It is about conserving and preserving the marine environment and ensuring that the resources (and financial benefits of mining) are available to future generations.[15] Sharing the resources and ensuring their conservation for future generations puts the Common Heritage of Mankind principle in the sustainable development context.[16]

1.0.2 Environmental Issues

Craik notes, "compared with terrestrial and even near-shore activities, the state of knowledge of the deep seabed environment is low."[17] Nevertheless, it is believed that there is a significant risk of environmental damage arising from exploration or exploitation.[18] Drill cuttings settle quickly and then accumulate. They are then dispersed by currents and transported to nearby

[14] Erik van Doorn, "Environmental Aspects of the Mining Code: Preserving Humankind's common heritage while opening Pardo's box?" (2016) 70 Marine Policy 192–197; Marie Bourrel, Torsten Thiele & Duncan Currie, "The Common Heritage of Mankind as a means to assess and advance equity in deep sea mining" (2018) 95:C Marine Policy 311–316.
[15] Jaeckel, Gjerde & Ardron, *supra* note 9.
[16] *Ibid* at 151.
[17] Neil Craik, "Implementing adaptive management in deep seabed mining: Legal and institutional challenges" (2020) 114 Marine Policy 1 at 114–115.
[18] Tara Davenport, *Responsibility and Liability for Damage Arising Out of Activities in the Area: Potential Claimants and Possible Fora*, CIGI Liability Series for Deep Seabed Mining - Report 5 (2019) at 10, 13; DFO, *Assessment of the Effectiveness of Mitigation Measures in Reducing the Potential Impacts of Oil and Gas Exploration and Production on Areas with Defined Benthic Conservation Objectives*, Canadian Science Advisory Secretariat 2019/025 (National Capital Region, 2019); Julian Aguon & Julie Hunter, "Second Wave Due Diligence: The Case for Incorporating Free, Prior, and Informed Consent into the Deep Sea Mining Regulatory Regime" (2019) 38:1 Stanford ELJ 55 at 19; DOSI, *Deep-Sea Fundamentals Policy Brief* at 10; Greenpeace, *Deep Trouble: The murky world of the deep sea mining industry* (2020).

environments.[19] These cuttings may result in oxygen depletion, increased turbidity and other effects that negatively impact marine life.[20] Acid rock drainage also poses environmental risks, as does underwater noise, light, sewage, or oil releases and failures of seafloor tools during operation could negatively impact the ocean environment.[21] Studies predict adverse impacts on ecosystem structure and function, species abundance, and biodiversity, with little to no recovery of mined locations, even years after operations concluded.[22]

Seabed mining's substantial environmental damage would be mostly irreversible, with significant impacts on fisheries, sharks, whales, sea turtles, and other marine animals of cultural significance to Indigenous peoples.[23] Marine life impacts include loss of habitat and life-supporting substrates, killing fauna and flora, sediment plumes, exposure to toxic metals released during operations, harm to genetic links between different populations, habitat alteration through

[19] Blue Nodules, *Deliverable report D5.1 Report on inventory of environmental Pressures Deliverable Report: Final v10* (29 April 2016), online: https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5a896db42&appId=PPGMS.
[20] DFO, *supra* note 18; Donald Anton & Rakhyun Kim, "The application of the Precautionary and Adaptive Management Approaches in the Seabed Mining context: Trans-Tasman Resources Ltd. marine consent decision under New Zealand's Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012" (2015) 30:1 Int J Marine Coastal L 175 at 178.
[21] G Bridge, "Contested Terrain: Mining and the Environment" 29 Annual Review of Energy and Environment 205; Catherine Banet, *The Law of the Seabed: Access, Uses, and Protection of Seabed Resources* (Leiden, 2020) at 58.
[22] Davenport, *supra* note 18 at 9; A Chin & K Hari, *Predicting the impacts of mining of deep sea Polymetallic Nodules in the Pacific Ocean: A Review of Scientific Literature* (MiningWatch Canada, 2020); DOSI, *Sustaining Biodiversity Beyond National Jurisdictions: The Major Science Challenges*, Policy Brief (2018).
[23] Neil Craik, *Legal Liability for Environmental Harm: Synthesis and Overview*, CIGI Liability Issues for Deep Seabed Mining Series 1 (CIGI, 2018); Neil Craik, "Implementing adaptive management in deep seabed mining: Legal and institutional challenges" (2020) 114 Marine Policy 1 at 13; Aguon & Hunter, *supra* note 19 at 19, 27; David Stauth, "Hydrothermal Vents, Methane Seeps Play Enormous Role in Marine Life" (2016) Global Climate; Kirsten Thompson et al, "Seabed Mining and Approaches to Governance of the Deep Seabed" (2018) 5 Frontiers in Marine Science; Aline L Jaeckel, *The International Seabed Authority and the Precautionary Principle: Balancing Deep Seabed Mineral Mining and Marine Environmental Protection* (Boston: Boston : Brill Nijhoff, 2017); Kristina Gjerde et al, "Ocean in peril: Reforming the management of global ocean living resources in areas beyond national jurisdiction" (2013) 74:2 Marine Pollution Bulletin 540; Luc Cuyvers et al., *Deep seabed mining A rising environmental challenge* (IUCN: Gallifrey Foundation, 2018).

sediment, light and noise, and alteration of large-scale ocean cycles.[24] These risks caused over eighty (80) organizations and governments to campaign for a seabed mining moratorium.[25]

1.0.3 Sustainable Development, the Climate Crisis, and Seabed Mining

The Common Heritage of Mankind and environmental protection are linked with sustainable development. The International Panel on Climate Change ("IPCC") asserts that to avoid the worst effects of climate change and to limit warming to less than two (2) degrees Celsius, States must eliminate fossil fuel usage by 2050.[26] Governments are increasingly promoting a low-carbon economy and reducing the use of fossil fuels.[27] To accomplish this goal of a low-carbon future, the mining industry argues that advanced battery technologies and alternative energy sources will inevitably increase demand for a range of critical minerals.[28] For example, lithium, cobalt, copper, gold, and rare earth minerals are utilized in most electronic devices and low-carbon technologies such as electric vehicles, wind turbines, and solar power equipment.[29] Companies and States involved in seabed mining exploration argue that many of the minerals found on the deep seabed are the minerals required to transition to a green economy.[30] Proponents of seabed mining argue that the industry would open up a low-cost, socially

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[24] Pippa Howard et al., An assessment of the risks and impacts of seabed mining on marine ecosystems (Flora and Fauna International, 2020); Ocean Health, "Habitat Destruction" online: http://www.oceanhealthindex.org/methodology/components/habitat-destruction-intertidal.

[25] Deep Sea Mining Campaign, *Why the Rush? Seabed Mining in the Pacific Ocean* (Mining Watch Canada, 2019); Chin & Hari, *supra* note 22 at 48; WWF, *In Too Deep: What we Know and Don't Know about Seabed Mining* (2021); Deepsea Conservation Coalition, *Deep-sea mining: Growing Support for a Moratorium,* Deep Sea Mining Fact Sheet 3, online: https://www.noseabedmining.org/; European Parliament, *Resolution of 16 January 2018 on international ocean governance: an agenda for the future of our oceans in the context of the 2030 SDGs*, online: http://www.europarl.europa.eu/doceo/document/TA-8-2018-0004_EN.html at paras 42, 19, 22 & 67.

[26] IPCC, *Mitigation of Climate Change, Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change,* P.R. Shukla, et al. [eds] (IPCC, 2022).

[27] James R Hein et al, "Deep-ocean mineral deposits as a source of critical metals for high- and green-technology applications: Comparison with land-based resources" (2013) 51 Ore geology reviews 1–14 at 4.

[28] Kerry Krutilla et al., *Implementing Precaution in Benefit-Cost Analysis,* Policy Research Working Paper 9307 (World Bank Group, 2020) at 2.

[29] Hein et al, *supra* note 27.

[30] This assumption is potentially controversial and will be discussed in Chapter 6.

acceptable pathway for minerals to enter supply chains, dampening any stark rise in mineral prices. Increasing metal prices make the mineral markets an attractive investment for private and government enterprises. Sourcing minerals from the seabed may enable a company to avoid sources associated with notorious human rights violations.[31] The practice of seabed mining may allow some developing countries to benefit from resource extraction as a route to development.[32]

Opponents argue that adding another source of minerals could undermine long-term incentives to scale recycling efforts, especially in emerging economies.[33] Given all of the previously described potential impacts of seabed mining, is society engaged in the process of environmental problem shifting? Is society swapping issues of carbon emissions for other environmental problems of land degradation, biodiversity loss, soil erosion and other problems? Circular economy advocates aim to decouple global economic growth from natural resource use, decrease environmental degradation, and improve energy efficiency.[34] As humanity moves from a fossil fuel-based economy to a low-carbon one (or at least attempts to), it should be apparent that society should be cautious about transferring environmental risk. A foundational question should be whether humanity is creating new and potentially worse problems than before. Earth is in a climate crisis, yet governments, corporations and regulators rush to technologies that demand new materials whose supply and use result in other degradation challenges. Choosing low-carbon technologies is OK and 'green' as long as it does not release carbon emissions.[35] This

[31] Amnesty International, *"This is what we die for": Human Rights Abuses in the Democratic Republic of the Congo and the Global Trade in Cobalt* AFR 62/3412/2016 (2016).
[32] Bolong, *supra* note 4.
[33] Takuma Watari et al, "Total material requirement for the global energy transition to 2050: A focus on transport and electricity" (2019) 148 Resources, conservation and recycling 91–103.
[34] P. de Sa & J Korinek, *Resource efficiency, the circular economy, sustainable materials management and trade in metals and minerals"* OECD Trade Policy Papers No 245 (OECD, 2021); International Renewable Energy Agency, *Global energy Transformation: A Roadmap to 2050* (2019).
[35] Mirjam Christina Rahn, *Deep-sea mining of seafloor massive sulfides and seafloor manganese nodules: deposit modelling and market potential* Universitätsbibliothek, 2019) [unpublished] at 49.

assumption raises a larger question of how the world will sustain itself in the future. Seabed mining may represent a microcosm of the inherent difficulties in sustainable development.

In 2015, 170 world leaders endorsed the *2030 Agenda for Sustainable Development* (the "SDGs").[36] The seventeen SDGs provide a call to action. Sustainable Development Goal 14 ("SDG14"), *Life Below Water,* attempts to enhance the conservation and sustainable use of oceans and their resources.[37] The development of the blue economy (as explained in Chapter 6) and the sustainable use and protection of the marine environment should function as an overarching goal, as reflected in SDG14. This necessary common approach is justified by the essential place the seabed has in what can be called the ocean commons. The United Nations Environment Programme proposed the *Sustainable Blue Economy Finance Principles*.[38] The *Sustainable Blue Economy Finance Principles* define a sustainable blue economy as one that

> provides social and economic benefits for current and future generations, restores, protects and maintains diverse, productive and resilient ecosystems; and is based on clean technologies, renewable energy and circular material flows. It is an economy based on circularity, collaboration, resilience, opportunity and interdependence.[39]

The *Sustainable Blue Economy Finance Principles* promote the implementation of SDG14 and set out ocean-specific standards, allowing the finance industry to mainstream the sustainability of ocean-based sectors. In their guide for concrete recommendations to financial institutions, the United Nations Environment Programme was clear that a sustainable blue economy must exclude seabed mining.[40] However, the ISA is moving ahead with regulations

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[36] *Transforming Our World: The 2030 Agenda for Sustainable Development*, 69th Session, UN Doc A/70/L1 2015.
[37] World Bank Group, *Minerals for Climate Action: The Mineral Intensity of the Clean Energy Transition* (Washington, DC, 2020) at 7.
[38] UNEP FI, *The Sustainable Blue Economy Finance Principles,* online: https://www.unepfi.org/blue-finance/the-principles/.
[39] UNEP FI, *Rising Tide: Mapping Ocean Finance for a New Decade*, Sustainable Blue Economy Finance Initiative (UNEP, 2021) at 17.
[40] UNEP, *Turning the Tide: How to finance a sustainable ocean recovery A practical guide for financial institutions (UNEP, 2019)* at 16; Ecorys, *Unsustainable Finance in the Blue Economy: Where Does the Money Come From? Recommendations Report (Prepared for European Commission, September 2020)* at 12. The sustainable blue economy excludes non-renewable extractive industries (e.g., offshore oil and gas, seabed mining).

for exploiting the seafloor. The European Commission is set against seabed mining yet allows Belgium, Germany, France and the United Kingdom to be Sponsoring States and active promotors of the nascent industry.[41]

I use sustainable development and global initiatives such as the SDGs and *Sustainable Blue Economy Finance Principles* as the thesis's conceptual backdrop. These initiatives identify problem areas and help create recommendations to encourage environmentally and socially responsible mining behaviours. Mining can foster economic development by providing employment opportunities, business development, increased fiscal revenues, and infrastructure linkages between various states. Seabed mining could potentially do the same. The key to economic development is development. Mining development requires significant capital and financing. The next sub-section overviews seabed mining finance, the links between finance and the law, and land-based mining financial requirements. It shows that financing and economic benefits must be carefully weighed against environmental and social protections.

1.1 Seabed Mining Finance

The ISA is mandated to develop the financial requirements for seabed mining.[42] These provisions may include royalty payments, taxation, capital requirements, environmental compensation funds, environmental performance guarantees, and insurance requirements. As detailed in later chapters, taxation methods, financing models, capital requirements, royalties, revenues, and expenses interact with environmental and social protections.[43] The ISA is currently developing the Mining Code's financial provisions and the financial provisions in the

[41] See Chapter 3 for details.
[42] *UNCLOS*, *supra* note 7, Articles 160, 162; *1994 Agreement, supra* note 7, Annex, ss. 1(5), 2, 8.
[43] See Chapter 3 for a discussion of the actors in seabed mining, Chapter 4 for land-based discussions of royalties and disclosure requirements, Chapter 5 for the ISA's recommendations and guidelines on mineral evaluation.

Draft Standards and Guidelines.[44] These provisions are in draft form and not finalized. There is substantial work that is still required to be done.

A goal of the ISA is to ensure an optimum benefit for itself.[45] The regulator has not addressed if and how resources recovered from seabed mining could be distributed globally and equitably.[46] This optimum revenue may contradict the Common Heritage of Mankind and intergenerational equity, key concepts in seabed mining.[47] Optimum revenue may not be implementable due to various types of mining operations and the different technologies used.[48]

Seabed mining must be developed so that rates of payments are within the range of land-based mining operations. The goal is to prevent giving seabed mining an artificial competitive advantage.[49] As detailed in Chapter 5, valuing minerals is a mining operation's most important element. This dissertation attempts to address this gap in the literature and focus on the legal requirements for valuing minerals from a land-based mining perspective.

Why focus on finance for a legal dissertation? While most researchers incorrectly and artificially separate the two, I believe law and finance are intertwined. The current financial literature does not create a necessary link between the law and finance. We need a strong theoretical link between law and finance. Thus, before a review of land-based mining valuation

[44] ISA, Standards and Guidelines, *supra* note 5.
[45] *UNCLOS*, *supra* note 7, Annex III, 13(1)(a); ISA, *Towards the Development of a Regulatory Framework for Polymetallic Nodule Exploitation in the Area*, Technical Study 11 (2013).
[46] Thompson et al, *supra* note 23; ISA, « Equitable sharing of financial and other benefits from deep seabed mining" online: https://equitablesharing.isa.org.jm/.
[47] Chapter 2 extensively details these requirements.
[48] See Chapter 5 for analysis.
[49] Wolfgang Hauser, "An International Fiscal Regime for Deep Seabed Mining: Comparisons to Land-Based Mining" (1978) 19 Harvard international law journal 759; Claire Armstrong et al, "Services from the deep: Steps towards valuation of deep sea goods and services" (2012) 2 Ecosystem services 2; Maja Vinde Folkersen, Christopher Fleming & Syezlin Hasan, "The economic value of the deep sea: A systematic review and meta-analysis" (2018) 94 Marine Policy 71–80.

methods, a short overview of the Legal Theory of Finance will help ground the reader with a conceptual link between finance and the law.

1.1.1 Legal Theory of Finance

The Legal Theory of Finance, developed by Katharina Pistor in 2013, asserts that finance is legally constructed and does not stand outside the law.[50] Law is central to finance in at least three respects: law lends authority to the means of payment, law spurs regulatory pluralism by delegating rulemaking to various stakeholders, and law vindicates financial instruments and other financial contracts.[51] Financial assets, including capital assets, are complex instruments, and their value primarily depends on being legally vindicated.[52] The primary function attributed to the law is that it empowers creditors to enforce their contracts. The Legal Theory of Finance raises questions about who can make or remake law in all its manifestations and for whose benefit. How the law is perceived depends upon the models or paradigms applied to its recognition. These paradigms may vary according to their different methodological approaches.[53]

Why use the Legal Theory of Finance? It helps to understand how and why the law creates certain financial conditions. It should assist in understanding the inherent risks of the ISA's processes and help craft recommendations for avoiding these instabilities in future seabed mining activities. Legal scholars should not avoid finance. Rather, they should understand that finance and the law are intertwined. Moreover, the Legal Theory of Finance asserts that law involves both the State (broadly construed to refer to a realm of public ordering) and private or

[50] Katharina Pistor, "A legal theory of finance" (2013) 41:2 Journal of Comparative Economics 315.
[51] *Ibid* at 315.
[52] Rainer Haselmann, Katharina Pistor & Vikrant Vig, "How Law Affects Lending" (2010) 23:2 The Review of Financial Studies 549.
[53] Ruth Aguilera & Cynthia Williams, "Law and finance: inaccurate, incomplete, and important. (Evaluating Legal Origins Theory Symposium)" (2009) 6 BYULR 1413 at 1418.

customary arrangements and that reducing law to just one of these two aspects is mistaken.[54] Mining the seafloor involves States that sponsor private contractors. Valuing minerals is a legal and economic process. Land-based mineral asset valuation codes, the central theme of the dissertation, are used in securities and corporate law practices.[55] In other words, land-based mining valuation codes are legislated instruments, i.e., law.

Critiques of the LTF are few. Many critiques pertain to law and finance theories developed before the LTF. For example, the "law and finance theory" predicts that the common law system provides the best basis for financial development and economic growth but has been criticized for being too western and politically biased.[56] The LTF, being an inductive theory, is critiqued for its view of apex and periphery.[57] None of these critiques of the LTF is relevant to this dissertation. Certain small island developing states, such as Nauru and Tonga, are instrumental in the development of seabed mining and are thus as central as the United Kingdom. Moreover, as shown in the next chapter, as the United States is not a party to the law of the sea, these small states have significant influence on seabed mining finance. As such, this dissertation adds to the LTF literature by providing a rethink of the predominant world view. Yet, as also shown, these small States will use contractors from large western States. As shown, the securities commissions from Canada and the United States influence mining development and mining finance. The LTF is comprehensively engaged with and critiqued in Chapter 4.

[54] Simon Deakin et al, "Legal institutionalism: Capitalism and the constitutive role of law" (2017) 45:1 Journal of Comparative Economics 188; Katharina Pistor, "Towards a new transition economics" (2013) 21:1 Economics of Transition 11.
[55] Further discussed in Chapter 6.
[56] Michael Graff, "Myths and truths: The law and finance Theory revisited" (2006) KOF Working Papers, No. 122, (KOF Swiss Economic Institute, 2006) THL Beck, A. Demirgüç-Kunt, & R. Levine, "Legal theories of financial development" (2001) 17:4 Oxford Review of Economic Policy 438.
[57] See Chapter 4 for a review of the critiques of the LTF.

1.1.2 Securities Law, Mineral Asset Valuation Codes and Seabed Mining

Mining firms need capital to advance exploration projects, conduct feasibility studies, design and construct mines, purchase or lease equipment and fund exploitation activities.[58] Valuation of mining projects is relevant to equity and debt investments, project finance, joint ventures, and investment of projects. Terrestrial mining associations have created best practices to value their projects. These best practices often form international soft law and domestic hard law, i.e., legislated.[59] A mineral valuation code is one best practice that is also legislated, hard law.[60]

Mineral valuation codes help to value minerals in a fair, consistent and accurate manner. They help ensure complete, accurate, and consistent mineral information and provide for the public disclosure of this information to investors.[61] For Canada and the United States (and several other jurisdictions), asset valuation codes are required under securities legislation.[62] Securities law disclosures must provide full, true and plain disclosure of all material facts relating to the securities issued or proposed to be distributed.[63] In Canada, National Instrument 43-101, *Standards of Disclosure for Mineral Project*s, states that a technical report must be filed for anyone issuing securities, whether publicly or on a private placement basis.[64] Similar

[58] Michael Seeger, *Mining Capital* (Switzerland: Springer, 2019) at 2–6.
[59] John Williams, "International Best Practice in Mining: Who Decides and How Does it Impact Law Development?" (2008) 39:4 Georgetown Journal of International Law 693.
[60] *The CIMVAL Code for the Valuation of Mineral Properties* (CIMM: 2019).
[61] Keith Abergel, *Mineral Asset Valuation Codes: Towards an International Standard* (MASc, Queen's University, 2014) [unpublished]; *CIMVAL*, *supra* note 59; IMVAL, *International Mineral Property Valuation Standards Template 4th Ed.* (IMVAL, 2021).
[62] *Standards of Disclosure for Mineral Projects, Form 43-101F1 Technical Report and Related Consequential Amendments NI 43-101*, NI 43-101 2011; *Technical Report and Related Consequential Amendments 34 OSCB 7043 (24 June 2011)*; *Commission Guidance Regarding Disclosure Related to Climate Change 17 CFR PARTS 211, 231 and 241*, by SEC, [Release Nos. 33-9106; 34-61469; FR-82] (SEC, 2010) at 229.
[63] *Securities Act*, RSO 1990, c S5 at 61(1); *General Prospectus Requirements*, OSC NI 41-101 (6 July 2017).
[64] *Standards of Disclosure for Mineral Projects*, *supra note* 60.

requirements exist in several other countries, such as the United States[65] and Belgium.[66] Moreover, valuing minerals helps determine the royalty payment due to the host country.

Seabed mining regulations contain several provisions similar to a valuation code. The ISA has provided guidance and recommendations to contractors for structuring their reports for mineral deposits.[67] They have a policy guidance document on mineral reserves but have not undertaken any work to transform this guidance into a valuation code.[68] Moreover, there are crucial differences between the current regulatory system, the ISA's recommendations, and a mineral valuation code. The lack of a valuation code for seabed mining means no cash flow estimate guidelines exist in regulations. Moreover, no financial guidance exists to help develop disclosure rules for those firms with securities disclosure requirements. In other words, seabed mining contractors do not need to disclose financial information to the public, unlike publicly traded corporations.[69] Applicant contractors need only provide the ISA with information, the extent of which is still being debated.[70] The current seabed mining regulations allow for minerals to be valued in a manner that is unacceptable in those jurisdictions that utilize a mineral asset valuation code. Currently, seabed minerals are considerably overvalued compared to their land-based counterparts.[71]

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[65] *Securities Act of 1933* 15 U.S.C. § 77a et seq., *Securities and Exchange Act, 1934*, 15 U.S.C. § 78a et seq. Pub.L. 73–291, 48 Stat. 881, enacted June 6, 1934; s. 4.; *Securities Commission Act*, 15 U.S.C. §§ 77a-77aa 20, 15 U.S.C. §§ 78a-78pp.

[66] *Directive 2013/34/EU of the European Parliament and of the Council of 26 June 2013 on the annual financial statements, consolidated financial statements and related reports of certain types of undertakings*, amending Directive 2006/43/EC of the European Parliament and of the Council and repealing Council Directives 78/660/EEC and 83/349/EEC.

[67] ISA, *Recommendations for the guidance of contractors on the content, format and structure of annual reports* ISBA/21/LTC/15, (4 August 2015) online: https://isa.org.jm/files/files/documents/isba-21ltc-15_1.pdf.

[68] As detailed in Chapters 5, 6, and 7.

[69] See Chapter 4 for disclosure requirements of land-based mining corporations.

[70] See Chapter 5 for additional details.

[71] See Chapter 5, 6, 7. Randolph Kirchain & Frank Field, F*inancial Regimes for Polymetallic Nodule Mining: A Comparison of Four Economic Models*, (MIT - MSL Material Systems Laboratory, 2019); Randolph Kirchain et al., *Development of an Economic Model and System of Payments for the Exploitation of Polymetallic Nodules in the Area* (MIT Materials Systems Laboratory, 2019).

I do not assert that land-based mineral valuation codes are ideal models. Land-based mineral valuation codes have been critiqued for not addressing environmental and social factors.[72] Securities laws may not have robust climate and environmental disclosures. Part of the outcomes of this dissertation uses sustainable development principles to recommend improving land-based mining valuation codes. This dissertation posits that a mining valuation code similar to a land-based valuation code is needed for seabed mining. Recommendations for a seabed mining valuation code include environmental and social indicators. Sustainable development law informs which environmental and social factors to include in such a code.

1.2 The Research Question

This thesis answers the following questions:

- How might the legal framework for seabed mining finance in the international seabed area be envisioned to enable an environmentally and socially sustainable industry for the low-carbon world?
- How does the law shape the financing of seabed mining such that a mineral asset valuation code could be developed to assist contractors with the sustainable exploitation of minerals found on the seabed?

1.3 Aim of Dissertation

This dissertation addresses issues in seabed mining finance and assists regulatory authorities by recommending a seabed mining asset valuation code. This seabed mining valuation code could apply to all contractors and mining operators, regardless of how they are formed, owned or legally structured. I propose to utilize Pistor's Legal Theory of Finance to show that in seabed mining, finance depends on the law. Mineral asset valuation codes are law and have the force of regulation. I use international sustainable mineral development law as the dissertation's conceptual framework. This framework utilizes global initiatives, such as the SDGs, the

[72] G Njowa & C Musingwini, "A framework for interfacing mineral asset valuation and financial reporting" (2018) 56 Resources Policy 3.

Sustainable Blue Economy Principles, and the social licence to operate to encourage environmentally and socially responsible mining behaviours and to inform the necessary components of a seabed mining valuation code.[73] Terrestrial asset valuation codes research shows a gap in incorporating environmental, social, and governance factors. This valuation code incorporates environmental and social factors into financial analysis and integrates sustainable development and finance.

The dissertation's recommendations assist with issues of information asymmetry. The ISA relies on information that States and contractors provide. Most of this information is deemed confidential and not provided to the public. Thus, there is an asymmetric knowledge base. This asymmetric information has three important consequences. First, the lack of information may hinder investors from financing seabed mining operations. Second, it may hinder environmental groups from obtaining information on environmental damage. Third, the lack of information may also give rise to issues of regulatory capture. When regulatory capture occurs, a special interest is prioritized over the general interests of the public, leading to a net loss for society.[74]

Stigler, in 1971, started with the premise that the government's main "resource" is the "power to coerce," and interest groups will seek to convince the government to use its coercive power to the group's benefit.[75] Interest groups try to capture government decision-making because it affects the industry and the consumers' welfare.[76] Alternatively, it can also stand for

[73] Colin Filer & Jennifer Gabriel, "How could Nautilus Minerals get a social licence to operate the world's first deep sea mine?" (2018) 95:C Marine Policy 394.
[74] Robert Baldwin, Martin Cave & Martin Lodge, *Understanding Regulation: Theory, Strategy, and Practice* (2013).
[75] George J. Stigler, "The Theory of Economic Regulation" (1971) 2:1 The Bell Journal of Economics and Management Science 3;
[76] J.J. Laffont, & J. Tirole, "The Politics of Government Decision-Making: A Theory of Regulatory Capture" (1991). 106:4 The Quarterly Journal of Economics, 1089; M. Croucher, "Are energy efficiency standards within the electricity sector a form of regulatory capture?" (2011) 39:6 Energy Policy 3602.

the proposition that environmental groups can influence an organization to have draconian regulatory provisions that make the industry unwieldy and uncompetitive.

This dissertation does not attempt a detailed analysis or critique of regulatory capture theory. Instead, the dissertation focuses on two major aspects of capture.

The first problem is the problem of environmental protection and capture.[77] Regulatory capture theory would indicate that the ISA may become too friendly with certain Sponsoring States and contractors rather than the international community.[78] Regulatory capture is just as likely to occur within a green economy framework as in our current natural resources extractivism economic framework; the urgency of hastening the transition to a low-carbon economy may make some form of regulatory capture possible and likely.

Research also shows that information asymmetry is one of the main causes of regulatory capture. Advocating for greater access to financial data and obtaining data sources is a key goal of this dissertation.[79] MacLean writes, "The best response to such biased, partial, and misleading information and expertise is better, independent, transparent, and tested information and expertise."[80] This dissertation thus adds to the regulatory capture literature by providing a seabed mining example. More importantly, the dissertation offers a solution to overcome this information asymmetry and minimize the potential for regulatory capture by having a public, standardized valuation code for seabed minerals.

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[77] Jason MacLean, "Regulatory Capture and the Role of Academics in Public Policymaking: Lessons from Canada's Environmental Regulatory Review Process" (2019) 52 UBC L Rev 479. M.E. Portman, "Regulatory capture by default: Offshore exploratory drilling for oil and gas" (2014) 65 Energy Policy 37

[78] Elaine Baker & Yannick Beaudoin, *Deep Sea Minerals and the Green Economy* (Secretariat of the Pacific Community, 2013) at 27.

[79] The Enterprise will be defined and analyzed in Chapter 3, *infra*.

[80] MacLean, supra note 77 at 57.

Regulatory capture is also noted in slowing, delaying and avoiding environmental concerns by special interest groups or reducing penalties should environmental damage occur.[81] This would make it easier for companies to ensure compliance with a policy, minimize actual and perceived violations and make inspection for enforcement unnecessary. The extractive industry's projects are complex and long term in nature, lasting in some instances of thirty (30 years or more. Regulatory and contractual violations may be harder to spot due to the complex multifaceted actions of contractors. While additional regulation may also signal capture, promoting a standardized, transparent way to value minerals could help avoid the more severe aspects of regulatory capture.[82]

1.4 Methodology

Seabed mining regulation and governance spans several research disciplines, including finance, management, law and human rights. The dissertation addresses and is limited to upstream seabed mining valuation activities. That is the mining of the seafloor, the vertical lifting of raw ore to the sea surface, and the loading onto the surface vessel. Issues of shipping, insurance, processing ores, the construction and operation of processing plants in a specific country, and other downstream activities are excluded from the analysis.

[81] T. Fitzgerald, "Regulatory capture in a resource boom" (2023) Public Choice 1; R.G. Holcombe, "Rethinking Regulatory Capture" (2022) 37:1 The Journal of Private Enterprise 33; M. Hadani, JP Doh, & MA Schneider, "Corporate Political Activity and Regulatory Capture: How Some Companies Blunt the Knife of Socially Oriented Investor Activism" (2018) 44:5 Journal of Management 2064.
[82] G Deltas, & H Wen, "Do voluntary corporate activities lead to reporting regulation? evidence from corporate social responsibility" (2022) 54:56 Applied Economics 6510; Jason MacLean, "Striking at the root problem of Canadian environmental law: identifying and escaping regulatory capture" (2016) 28 Journal of Environmental Law and Practice 111.

The legal method is the orderly, systematic way to research the law.[83] This thesis uses desk research based on legal methods to advance its goal of recommending a seabed mining valuation code. Due to the complexity of the subject matter, multiple legal methodologies are utilized. These methods are the doctrinal method and the comparative method. These methods present information systematically. Additionally, the principles of sustainable development and the integration of international legal principles provide a gap analysis to understand seabed mining and its inherent ethical dilemma and help guide the development of a seabed mining valuation code consistent with sustainable development principles. While interviews and other qualitative research methods were considered, they were rejected. The main reason was the pandemic, which made travel and in-person interviews impossible for 2020 and 2021, when the bulk of the research was conducted.

1.4.1 Doctrinal Method

This dissertation is primarily a doctrine-based thesis. A doctrinal research approach focuses on case law, statutes and other legal sources.[84] Doctrinal research examines law as a written body of principles that discerns and analyzes using only legal sources. A doctrinal rather than an empirical methodology was selected for its suitability, as well as its feasibility.[85]

The Law of the Sea includes the *United Nations Convention on the Law of the Sea, the Agreement relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982*, and *the Mining Code.* The *Mining Code* includes exploration regulations, the *Draft Exploitation Regulations*, recommendations, standards and

[83] Husa Jaakko, "Methodology of Comparative Law Today: From Paradoxes to Flexibility?" (2006) 58:4 Revue Internationale de droit comparé 1095 at 1096.
[84] Michael Adler & Jonathan Simon, "Stepwise Progression: The Past, Present, and Possible Future of Empirical Research on Law in the United States and the United Kingdom" (2014) 41:2 Journal of Law and Society 173 at 175.
[85] Aline Jaeckel, "The International Seabed Authority and Marine Environmental Protection: A Case Study in Implementing the Precautionary Principle" (2015) PhD Thesis Law, Faculty of Law, UNSW [unpublished].

guidelines. The Law of the Sea is the primary source of materials analyzed. Additionally, several international law cases, including the *Responsibilities and Obligations of States Sponsoring Persons and Entities with Respect to Activities in the Area ("Seabed Advisory Opinion")*, provide background information on seabed mining law and finance.

Secondary and tertiary sources include regulatory authority practices and academic opinions. It also includes the historical account of the creation of UNCLOS, including draft texts. The current regulatory framework states that data and information necessary for the formulation by the ISA of rules, regulations, and procedures concerning protecting and preserving the marine environment and safety, other than proprietary equipment design data, shall not be confidential.[86]

1.4.2 Comparative Method

Most research involves comparisons to better understand the law elsewhere, understand one's legal system better, and attempt to harmonize the law.[87] A comparative method obtains the information necessary to make recommendations on a seabed mining valuation code. Two main comparisons are made. The first is the comparison of domestic legislation with the international requirements under the law of the sea. Second is comparing the securities law disclosure and valuation code requirements of several of the largest land-based mining nations.

This dissertation analyzes the domestic legislation of the United Kingdom, Belgium, and Nauru regarding their seabed mining regulations. These jurisdictions were chosen due to their importance in the mining industry, land-based and seabed. Moreover, I chose these regulators due to my familiarity with their legal regimes, and more importantly, they are some of the States

[86] See discussion of the Mining Code, Chapters 2 and 3, *infra*.
[87] Patrick Glenn, "Aims of Comparative Law" in Jan Smits, eds, *Elgar Encyclopedia of Comparative Law* (UK: Edward Elgar Publishing, 2006).

involved in seabed mining.[88] I investigate their seabed mining legislation to determine whether environmental and social protections are contained in their domestic systems. Domestic seabed mining legislation does not advance environmental aims beyond what was done by the ISA.

Canada does not yet have seabed mining legislation for the Area. The United States is not a party to UNCLOS, yet it is an important actor in seabed mining. These two nations are crucial comparators for this dissertation. I compare securities law and valuation code requirements from Canada, the United States and the seabed regulator. Additionally, I compare the Australian and South African valuation codes as these are key land-based mining nations with strong financial regulations.[89] Australia, South Africa, Canada, and the United States have the most comprehensive valuation requirements of any land-based mining nation. As such, they are ideal comparators to the ISA's regulations. The dissertation compares mineral asset valuation codes to the work of the ISA as it relates to the valuation of mineral resources and reserves. The ISA has recommendations on mineral assets but does not have a valuation code.

Securities law disclosure data can be considered primary sourced information as it comes from the issuer and is subject to legal requirements. Under securities legislation, detailed financial and strategic disclosures are required.[90] Canada and the United States securities laws also require significant financial and strategic disclosure. A thorough comparison of valuation code requirements in Canada, the United States, and Australia assists in the gap analysis in the seabed regulator's techniques and supports the analysis for a seabed mining asset valuation code.

[88] As discussed in Chapter 3, *infra*.
[89] Australian Stock Exchange, "Metals & Mining Sector Profile" online: https://www.asx.com.au/documents/products/ASX-42769-Metals-and-Mining-Sector-Profile.pdf.
[90] See Chapter 6, *infra*.

To date, no environmental (or safety) data provided by contractors has been made publicly available.[91] Thus, obtaining the necessary data has been a critical challenge in this dissertation. Financial data is scarce. No feasibility study exists. Second, pre-feasibility studies are not made public.[92] State Enterprises are under no obligation to publish financial data.[93] The dissertation looks beyond the seabed context to find the necessary information. Contractor financial data for this dissertation comes from publicly available sources from Canada and the United States securities commissions.[94]

TMC, the Metals Company Inc. ("TMC"), is a publicly traded company based in Vancouver, Canada and traded on the NASDAQ Stock Exchange in the United States.[95] They are responsible for filing public disclosure documents in these jurisdictions. TMC's recent disclosures provide a significant amount of background financial information. TMC filings have been scrutinized by investors and regulators, especially regarding inflated revenue and profit information. This valuation has come under scrutiny by one potential class-action lawsuit.[96] Without a mineral valuation code, TMC was free to value its minerals without guidance.

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[91] Jeff A Ardron, "Transparency in the operations of the International Seabed Authority: An initial assessment" (2018) 95:C Marine Policy 324–331; JA Ardron, *Good governance of deep-seabed mining: transparency and the monitoring of environmental harm* (PhD Thesis, University of Southampton, Faculty of Ocean and Earth Science, Graduate School of the National Oceanography Centre, Southampton, 2020) [unpublished].
[92] Feasibility and pre-feasibility studies are defined and analyzed in Chapters 5 and 6.
[93] ISA, "Minerals: Polymetallic Nodules" online: https://www.isa.org.jm/exploration-contracts/polymetallic-nodules, ISA, "Minerals: Polymetallic Sulphides" online: https://www.isa.org.jm/exploration-contracts/polymetallic-sulphides, ISA, "Minerals: Cobalt-rich Ferromanganese Crusts" online: https://www.isa.org.jm/index.php/exploration-contracts/cobalt-rich-ferromanganese.
[94] SEC/EDGAR, "Company Filings" online: https://www.sec.gov/edgar/searchedgar/companysearch; Canadian Securities Administrators, "SEDAR" online: https://www.sedar.com/homepage_en.htm. The System for Electronic Document Analysis and Retrieval (SEDAR) (NI 13-101) adopted by the CSA, sets out general rules relating to electronic filing of certain documents with the CSA using SEDAR.
[95] The Metals Company, online: https://metals.co/; Edgar, "TMC." online: https://www.sec.gov/edgar/browse/?CIK=1798562&owner=exclude; Limited information will also be provided by Lockheed Martin Corp. and DEME Group - EDGAR, "Lockheed Martin Corp." online: https://www.sec.gov/edgar/browse/?CIK=936468&owner=exclude; DEME, "Filings" online: https://www.deme-group.com/.
[96] Block Leviton, *Carper v. TMC the metals company Inc. et al., (Case No. 1:21cv05991*), E.D.N.Y. online: https://www.blockleviton.com/cases/tmc; Campaign, "Watchdog Requests SEC Investigate Undisclosed Histories of

1.4.3 International Law and Sustainable Development

Doctrinal and comparative methods lack a theoretical and conceptual understanding of sustainable development. Rules of international law, including sustainable development, are primary research sources. These instruments, documents, and structures are examined in the context of the seabed mining regime's legal framework, the seabed authority, and judicial clarification. The dissertation uses international sustainable development law as applied to global mining (known as international sustainable development mining law) as applied to seabed mining to develop a framework to inform a sustainable seabed mining valuation code. Seabed mining may be dominated by only a few operators with the required technology and capital. These operators may concentrate wealth in the hands of a few.[97]

Valuing the environment through mechanisms such as environmental discounts or a social discount rate could assist in calculating the profitability of a seabed mining project. Thus, soft law frameworks, such as the Towards Sustainable Mining Initiative and the Extractive Industry Transparency Initiative, are appropriate for adding environmental and social factors to a seabed valuation code.[98] The material on sustainable development assists in recommending sustainable financial development and creating a seabed mining asset valuation code.

Deep Sea Mining Companies Seeking Merger" (22 July 2021) online: https://campaignforaccountability.org/watchdog-requests-sec-investigate-undisclosed-histories-of-deep-sea-mining-companies-seeking-merger/; Louis Navelier, "TMC Is Drowning in Legal Woes and Environmental Concerns" (25 October 2021) online: https://investorplace.com/2021/10/tmc-stock-is-drowning-in-legal-woes-and-environmental-concerns/.

[97] Defined and discussed in Chapter 2, *infra*.

[98] EITI, online: https://eiti.org/; NRCan, "Extractive Sector Transparency" online: https://www.nrcan.gc.ca/our-natural-resources/minerals-mining/extractive-sector-transparency-measures-act/18180; Mining Association of Canada, "Towards Sustainable Mining" online: https://mining.ca/towards-sustainable-mining/.

Sustainable development, as currently framed, is not without critique. Sustainable development, it is argued by some, cannot place humanity outside the environment.[99] The illusion of infinite growth from a finite planet is uncovered.[100] From a mining perspective, the question becomes how does society solve a planetary crisis when some strategies for mitigating climate change could negatively impact biodiversity or cause other environmental issues? For example, mining for materials needed to develop renewable energy and battery storage technology and altering natural environments to build renewable energy infrastructure or plant crops for biofuel feedstock can harm biodiversity.[101] The dissertation critiques certain aspects of sustainable development in a manner that serves to improve land-based mining valuation codes. The analysis provided in Chapter 4 uncovers gaps in environmental and social protections in securities law and valuation code requirements and provides the basis for some principles in the sustainable seabed mining valuation code developed in Chapter 7.

1.5 Relevance and Importance of Dissertation

The exploitation and conservation of the seabed pose fundamental questions for consideration by regulators, academics, scientists, jurists, policymakers, and politicians. Commercial aspirations by contractors and nations compete with domestic and international strategic goals and global ecological concerns. There is a balance between enabling seabed resource use and preserving fragile environments. Seabed mining is controversial as it creates an uncomfortable dilemma. On the one hand, humanity may require nickel, manganese and rare-earth minerals to move to a low-carbon economy. It is these minerals that are found on the seabed. The dilemma stems

[99] Sumudu Atapattu, Carmen Gonzalez and Sara Seck, "Intersection of Environmental Justice and Sustainable Development" Sumudu Atapattu, Carmen Gonzalez and Sara Seck [eds] *The Cambridge Handbook of Environmental Justice and Sustainable Development* (Cambridge, 2022) at 4.
[100] *Ibid* at 5.
[101] Holly Niner et al., "Deep-Sea Mining With No Net Loss of Biodiversity—An Impossible Aim" (2018) 5 Front Mar Sci 53.

from whether humanity needs seabed mining for these minerals or whether land-based sources provide sufficient resources. Canada is resource-rich in lithium, graphite, nickel, cobalt, aluminum and manganese, key ingredients for advanced battery manufacturing and storage.[102]

The second aspect of this dilemma is whether society is comfortable with environmental and social ills caused by land-based mining. As a former lawyer, investment advisor and environmental banker, I have deep familiarity with carbon reduction initiatives and their financing. I have worked for three major financial institutions and understand the risks of a new venture. Humanity may run into an industry with equally destructive environmental potential. Are we comfortable with the nature and extent of environmental impacts?

The importance of this thesis lies not just in its content but also in its timing. There is a window of opportunity to set environmental parameters and safeguards and create a seabed mineral asset valuation code before commencing commercial mining in the international area. The issues and concerns inherent to the seabed have been known since the 1950s. The legal framework and technology were not ready to exploit the seabed. The legal framework is being developed and is nearing completion, intending to complete it by the end of 2023.[103]

Technologies are rapidly advancing to the point that exploration is ongoing, and exploitation may soon be commercially viable. The heightened concern about climate change and the switch to a low-carbon economy, especially on the rapid development of electric vehicles, may speed up exploiting the minerals found on the seabed. The intertwined themes of good governance and environmental protection are discussed throughout this thesis, asserting

[102] Cecilia Jamasmie, "Canada has right ingredients to be EV battery leader" Mining.com (19 May 2021) online: https://www.mining.com/canada-has-right-ingredients-to-be-ev-battery-leader/.
[103] Helen Reid & Jeff Lewis, "Deep-sea mining rules to be fast-tracked in push from Nauru -source" (29 June 2021) online: https://www.reuters.com/business/environment/exclusive-deep-sea-mining-rules-be-fast-tracked-push-nauru-source-2021-06-25/.

that neither is without transparency (details of contractual performance) and access to reliable scientific (environmental monitoring) data, respectively.[104] Regulatory actions should be based on reliable scientific baseline surveys, ongoing monitoring of impacts and changes, and access to data. This would allow for the review and consideration of experts and stakeholders.

1.6 Organization of Dissertation

The dissertation is grouped into seven chapters. This current chapter introduced seabed mining and current issues with its development. Chapter 1 introduced the research question, the aims of the dissertation, and the methods utilized, including their justifications. It also introduced the thesis's basic concepts, described the methodologies used, and framed its organization.

Chapter 2 provides a historical perspective of the law related to seabed mining, detailed as a historical narrative. The chapter details the history of seabed mining, from early exploration in the late 1800s to early attempts in the 1950s to frame and commercially develop the industry. Next, the chapter focuses on the history of the intergovernmental conferences on the law of the sea to help structure the basis of the regulatory environment. The chapter summarizes the current international programme to organize, regulate and control seabed mining. The chapter concludes with a review of the Common Heritage of Mankind.

Chapter 3 introduces the parties in seabed mining. The chapter introduces the Enterprise using a historical narrative as a conceptual backdrop. The Enterprise will be the operating arm of the ISA but does not currently exist. Next, the ISA, the contractor, the Sponsoring State, Flag States, the processing State, and other parties are reviewed. The chapter pays particular attention to gaps in liabilities and environmental and social harms by investigating international tribunal decisions and Sponsoring State legislation.

[104] Ardron, *supra* note 89.

Chapter 4 analyzes land-based mining finance. The chapter reviews the Legal Theory of Finance proposed by Pistor. This theory is used for one purpose – that law and finance are related, and as such, a mineral asset valuation code is law. The chapter examines the mining finance and securities law requirements in Canada and the United States. These jurisdictions were chosen due to the author's familiarity with the regulatory environment and because they are the home States for the only publicly traded, non-government-owned contractors in seabed mining. Next, the chapter reviews mineral asset valuation codes, providing a gap analysis of valuation techniques, focusing on the lack of environmental and social protections. Finally, a short overview of land-based mining royalty systems is undertaken.

Chapter 5 provides a detailed literature review of the proposed financial mechanisms for seabed mining. The chapter then focuses on the work conducted by the ISA on measuring mineral resources through the lens of their reporting standard. A comparison of the reporting standard and land-based mining valuation codes shows that while the ISA has conducted a significant amount of work on seabed mining finance, it has not done enough to value the minerals on the seafloor properly, and its recommendations do not match the level required by land-based valuation codes. Information from disclosure data from Canadian and American securities regulators illustrates how securities regulators are dubious about seabed mining's environmental and social claims and about how minerals are valued on the seafloor. Finally, the proposed equitable sharing mechanism is reviewed, including the Environmental Compensation Fund, Seabed Sustainability Fund, and Environmental Performance Guarantee.

Chapter 6 provides an overview of sustainable development law, sustainable oceans and sustainable mining, and sustainable finance frameworks. Components of sustainable development law include the precautionary and ecosystem approach, inter and intra-generational

equity, public participation and good governance, and environmental impact assessment. Chapter 6 provides a literature review of several critiques of the current definition of sustainable development. Next, the chapter reviews the Towards Sustainable Mining, IGF Mining Policy Framework, and United Nations Principles on Tailings Management frameworks and discusses sustainable finance through several sustainability disclosure frameworks.

Chapter 7 incorporates the dissertations' research into a set of principles for capitalizing on seabed mining projects to minimize environmental and human rights harms. These ten (10) principles could facilitate a sustainable seabed mining valuation code, which would apply to all seabed mining contractors, regardless of their nationality and method of incorporation. The principles incorporate equitable sharing, the Common Heritage of Mankind, environmental valuation, public disclosure, standardization, integration with financial metrics such as royalties and funds and improving land-based mining valuation codes.

Chapter 2 – Overview of Seabed Mining and the Law of the Sea

Chapter 2 reviews the law for seabed mining, beginning with an overview of the types of resources anticipated to be mined. The chapter then provides a historical overview of the law of the sea and reviews the provisions of the *United Nations Convention on the Law of the Sea* ("UNCLOS"), the work of the Preparatory Commission in the 1980s and early 1990s, and the amendments made in the *Agreement relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982*. The chapter then analyzes the work of the ISA, the *Draft Exploitation Regulations* and the *Draft Standards and Guidelines*. The chapter concludes with a review of the Common Heritage of Mankind.

2.0 Resources on the Seafloor

Seabed mining is envisioned to exploit three principal types of resources: polymetallic nodules, polymetallic sulphides, and cobalt crusts.[1] Polymetallic nodules are any deposit or accretion on or just below the deep seabed surface containing higher concentrations of manganese, nickel, cobalt, copper, traces of molybdenum and rare earth elements.[2] Polymetallic nodules spread over the seabed's abyssal plains at depths exceeding 4,000 metres and can support high biodiversity.[3] It is anticipated that the first seabed mining operations will be nodule mining as it is the most developed in technological readiness and commercial viability and is akin to land-

[1] John Childs, "Greening the blue? Corporate strategies for legitimizing deep sea mining" (2019) 74 Political Geography 1 at 2.
[2] Patrick Colman Collins et al, "A primer for the Environmental Impact Assessment of mining at seafloor massive sulfide deposits" (2013) 42 Marine Policy 198; Catherine Danley, "Diving to New Depths: How Green Energy Markets Can Push Mining Companies Into the Deep Sea, and Why Nations Must Balance Mineral Exploitation with Marine Conservation" (2019) 41:1 William & Mary Environmental Law and Policy Review 219.
[3] Collins et al, *supra* note 2.

based mining.[4] The most extensive nodule deposits have been found in the Clarion-Clipperton Fracture Zone ("CCZ") and the Central Indian Ocean basin.[5]

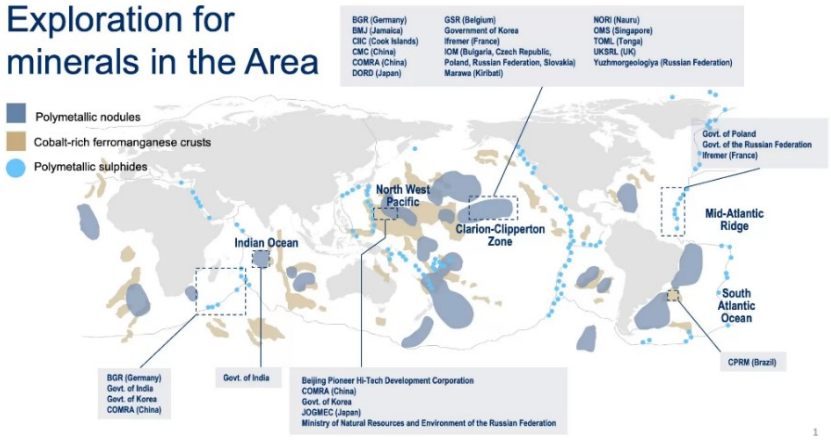

Figure 1 - Map 1 Exploration areas in the international seabed Area.[6]

Polymetallic seafloor massive sulphides are hydrothermally formed deposits of sulphides containing copper, lead, zinc, gold, and silver.[7] Polymetallic sulphides are found on collapsed hydrothermal vent chimneys, formed by the precipitation of metallic sulphides from hydrothermal fluids in tectonically active regions.[8] Sulphide mineralization has been found at depths between 800 and 5,000 m.[9] The proposed mining of seafloor sulphide deposits will likely

[4] Sebastian Volkmann, *Blue Mining—Planning the Mining of Seafloor Manganese Nodules* (PhD Thesis, RWTH Aachen University, 2018) [unpublished] at 67; David Shukman, "Electric car future may depend on deep sea mining" (13 November 2019) BBC online: https://www.bbc.com/news/science-environment-49759626; ISA, *Proposed Technologies for Mining Deep-Seabed Polymetallic Nodules*, ISA Workshop 2001/07 (ISA, 1999); A Chin & K Hari, *Predicting the impacts of mining of deep sea Polymetallic Nodules in the Pacific Ocean: A Review of Scientific Literature* (Deep Sea Mining Campaign and MiningWatch Canada, 2020); DeepGreen, "Allseas acquires ship for deep-sea polymetallic nodule collection in partnership with DeepGreen" (2 March 2020), online: https://deep.green/allseas-acquires-ship-for-deep-sea-polymetallic-nodule-collection-in-partnership-with-deepgreen/; Kris Van Nijen, Steven Van Passel & Dale Squires, "A stochastic techno-economic assessment of seabed mining of polymetallic nodules in the Clarion Clipperton Fracture Zone" (2018) 95 Marine Policy 133.

[5] Walter Roest & Harald Brekke and Malcolm Clark, "The Scientific Challenges of Seabed Mining" in *Routledge Handbook of Seabed Mining* (Routledge, 2022); ISA, "CCZ" online: https://www.isa.org.jm.

[6] ISA, "Exploration Areas" online: https://www.isa.org.jm/exploration-contracts/exploration-areas/.

[7] Collins et al, *supra* note 2; Kerry Krutilla et al, *Implementing Precaution in Benefit-Cost Analysis Policy Research Working Paper 9307* (World Bank, 2020) at 4; ISA, *Minerals Other than Polymetallic Nodules of the International Seabed Area* (Kingston, Jamaica April 2004); ISA, *Polymetallic Massive Sulphides and Cobalt-Rich Ferromanganese Crusts: Status and Prospects,* ISA Technical Study No.2 (Kingston: Jamaica, 2000).

[8] Collins et al, *supra* note 2.

[9] Roest & Brekke and Clark, *supra* note 5 at 11.

resemble open-cut mining on land.[10] These deposits may be attractive to mining companies because any prospective seabed sulphide mine would have a "relatively small footprint."[11] Hydrothermal vents are known to support biologically significant ecosystems and can support endemic species communities.[12] Mineral extraction may severely impact these communities as the endemic species are "patchy and transient in nature."[13] No tested approaches to restore or rehabilitate vent ecosystems exist.[14] Industrial-scale, active interventions to restore hydrothermal vents on the seafloor will likely be costlier per hectare than any effort on land.[15]

Cobalt ferromanganese crusts contain significant concentrations of cobalt, titanium, nickel, platinum, molybdenum, tellurium, cerium, and other metallic and rare earth elements.[16] Crusts are often found on seamounts and can support high biodiversity and unique biological communities.[17] Seabed mining could severely impact these communities.[18] Ferro-manganese crusts occur throughout the global ocean, predominantly on the surface of sediment-covered abyssal plains. Mining operations could occur at depths from about 1500 to 2500m.[19] Because

[10] CL Van Dover et al, "Scientific rationale and international obligations for protection of active hydrothermal vent ecosystems from deep-sea mining" (2018) 90 Marine Policy 20 at 21.
[11] Collins et al, *supra* note 2.
[12] Sarah Dromgoole, "Continental Shelf Archaeology and International Law" in Geoff Bailey et al [eds] *The Archaeology of Europe's Drowned Landscapes* (Springer International Publishing, 2020) at 495.
[13] E Baker & Y Beaudoin, Deep Sea Minerals and the Green Economy (Secretariat of the Pacific Community, 2013) at 9; Van Dover et al, *supra* note 10 at 22.
[14] Volkmann, *supra* note 4 at 4.
[15] Van Dover et al, *supra* note 10 at 22.
[16] *Draft Regulations on Exploitation of Mineral Resources in the Area (2019)*, ISBA/25/C/WP1 at Schedule 1; *Decision of the Assembly of the International Seabed Authority relating to the regulations on prospecting and exploration for polymetallic sulphides in the Area*, ISBA/16/A/12/Rev1 2010 at Regulation 1(3); *Decision of the Assembly of the International Seabed Authority relating to the Regulations on Prospecting and Exploration for Cobalt-rich Ferromanganese Crusts in the Area*, ISBA/18/A/11 2012 at Regulation 1(3)(a); *Decision of the Council of the International Seabed Authority relating to amendments to the Regulations on Prospecting and Exploration for Polymetallic Nodules in the Area and related matters* ISBA/19/C/17 (2013) (2013) at Regulation 1(3).
[17] Collins et al, *supra* note 2 ; World Ocean, "Mineral Rich Crusts" online: https://worldoceanreview.com/en/wor-3/mineral-resources/cobalt-crusts/ (accessed 2 July 2022).
[18] *Ibid.*
[19] Krutilla et al, *supra* note 7 at 4; Carndo, *An Assessment of the Costs and Benefits of Mining Deep-sea Minerals in the Pacific Island Region* (Secretariat of the Pacific Community, 2016).

the cobalt crusts are firmly attached to the rocky substrate, they cannot be picked up like manganese nodules and are currently the least likely type of deposit to be mined.[20]

2.1 Early History - 1868 - 1949

Nodules were first discovered in 1868 during the Swedish Nordenskold expedition in the Kara Sea, yet the HMS Challenger expedition in 1873 is credited with first bringing up nodules from the seabed.[21] The results of the 1873-1876 voyage of the HMS Challenger discovered undersea mountains, ocean floor life, and manganese nodules.[22] The HMS Challenger's findings have become important, as we now understand some of the effects of human activity on the ocean.[23]

The early 1900s was a largely dormant period for seabed activities. The freedom-of-the-seas doctrine threatened to transform the oceans into another arena for conflict and instability.[24] Competing claims over territories, the spread of pollution, the laying of submarine cables, opposing demands for lucrative fish stocks, and growing tensions between coastal nations' rights to these resources and those of fishers of foreign fleets emerged as issues for ocean governance. In 1916, Admiral Storni of Argentina developed a doctrine favouring recognizing the rights of resources over the continental shelf.[25] In 1945, United States President Harry S Truman

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[20] Simone Martino & Lindsay Parson, "A comparison between manganese nodules and cobalt crust economics in a scenario of mutual exclusivity" (2012) 36:3 Marine Policy 790; Simone Martino & Lindsay Parson, "Spillovers between cobalt, copper and nickel prices: implications for deep seabed mining" (2013) 25:2 Miner Econ 107.
[21] Jeff Ardron, *Good governance of deep-seabed mining: transparency and the monitoring of environmental harm*. (GSNOCS) at 5.
[22] John Murray & Rev AV Renard, *Report of the Scientific Results of the Voyage of H.M.S. Challenger During the Years 1873-76 under the command of Captain George Nares, R.N. F.R.S. and the late Captain Frank Tourle Thomson, R.N.* (1891) online: http://www.19thcenturyscience.org/HMSC/HMSC-Reports/1891-DeepSeaDeposits/htm/doc.html. (accessed 20 May 2022).
[23] Eugene Miller & Joseph Delehant, "Deep Seabed Mining: Government Guaranteed Financing under the Maritime Aids of the Merchant Marine Act, 1936" (1980) 11:4 J Mar L Comm 453 at 456.
[24] UN, *The United Nations Convention on the Law of the Sea: (a historical perspective), online: https://www.un.org/Depts/los/convention_agreements/convention_historical_perspective.htm#Historical%20Perspective*.
[25] Argentina, *Lecture "Razón de ser de los Intereses Marítimos Argentinos" published in Argentina, Outer Limit of the Continental Shelf – Argentine Submission* (8 June 1906) online: https://www.un.org/Depts/los/clcs_new/submissions_files/arg25_09/arg2009e_summary_eng.pdf. The continental

unilaterally extended United States jurisdiction over all natural resources, including minerals, on their continental shelf.[26] In October 1946, Argentina claimed its continental shelf and the sea above it.[27] Chile and Peru in 1947 and Ecuador in 1950 asserted sovereign rights over a 200-mile zone, hoping to limit the access of distant-water fishing fleets and control the depletion of fish stocks in their adjacent seas.[28] Soon after the Second World War, Egypt, Ethiopia, Saudi Arabia, Libya, Venezuela, and certain Eastern European countries claimed a 12-mile territorial sea, departing from the traditional three-mile limit.[29]

In 1949, the International Law Commission selected territorial waters and the high seas as topics for codification.[30] The United Nations General Assembly Resolution 374 (IV) of December 1949 asked the International Law Commission to consider topics closely related to the high seas.[31] The International Law Commission ("ILC") was tasked to examine the law of the sea, to attempt to create a unifying convention, taking into account the legal, technical, biological, economic and political aspects, and to embody the results of its work in one or more international conventions or other instruments as it may deem appropriate.[32]

shelf is the seabed and subsoil of the submarine areas lying under the territorial sea extending to the continental margin's outer edge.

[26] United States, Proclamation 2667 of September 28, 1945, *Policy of the United States with Respect to the Natural Resources of the Subsoil and Seabed of the Continental Shelf* 10 Fed. Reg. 12,305 (1945) codified as Executive Order 9633 of September 28, 1945.

[27] Argentina, *Decree No. 14.708/46*, B.O. 05/12/1946 (A.I.2) (October 1946).

[28] *Maritime Dispute (Peru v. Chile),* Summary of the Judgment of 27 January 2014, ICJ Summary 2014/1.

[29] UN, *supra* note 24.

[30] International Law Commission, *Report of the International Law Commission on the work of its First Session* (12 April 1949) Official Records of the General Assembly, 4th Sess, Supp No. 10 A/CN.4/13 and Corr. 1-3.

[31] UNGA, *Recommendation to the International Law Commission to include the regime of territorial waters in its list of topics to be given priority* A/RES/374(IV), A/PV.270 06 Dec. 1949 32-8-8 (non-recorded).

[32] Tullio Teves, *Introductory Note on 1958 Geneva Conventions on the Law of the Sea Geneva*, 29 April 1958.

2.2 The Conferences on the Law of the Sea

The ILC's work culminated with the First United Nations Conference on the Law of the Sea ("UNCLOS I"), with the commission calling for a unified approach to ocean law.[33] UNCLOS I produced four conventions: *the High Seas Convention,* which codified the freedom of navigation, fishing, overflight and laying cables and pipelines.[34] It also resulted in the *Fishing and Conservation of Living Resources,* the *Continental Shelf Convention,* and the *Territorial Sea and Contiguous Zone Convention*.[35] The *Convention on the Continental Shelf* granted the Coastal State the exclusive right to exercise sovereign rights to explore and exploit natural resources within a country's continental shelf.[36] Further, it defined natural resources as all the mineral and non-living resources of the seabed, subsoil, and living organisms belonging to sedentary species.[37] This definition included organisms that are, at their harvestable stage, either immobile or unable to move except in constant physical contact with the seabed.[38] The Coastal State's rights over the continental shelf would not affect the legal status of the superjacent waters ('the high seas') or the airspace above those waters.[39]

The United Nations General Assembly, in 1958, requested the Secretary-General to convene a *Second United Nations Conference on the Law of the Sea* ("UNCLOS II") to consider

[33] Elizabeth Riddell-Dixon, *Canada and the International Seabed: Domestic Determinants and External Constraints* (McGill-Queen's University Press, 1989) at 6.
[34] *Convention on the High Seas*, 450 UNTS 82 1958.
[35] *Geneva Convention on the Continental Shelf, 499 U.N.T.S. 311*, 1958; *Convention on Fishing and Conservation of the Living Resources of the High Seas*, 559 UNTS 285 Convention on Fishing and Conservation of the Living Resources of the High Seas; *Convention on the Territorial Sea and the Contiguous Zone*, 516 UNTS 205 1958.
[36] *Ibid* at Article 2(1).
[37] *Ibid*.
[38] *Ibid* at Article 2(4).
[39] *Ibid* at Article 3; Riddell-Dixon, *supra* note 33 at 8.

the topics of the breadth of the territorial sea and fishery limits.[40] Substantive decisions on the breadth of the territorial sea, fishery limits and seabed mining were deferred to a later stage.[41]

Technological development during the mid-1960s allowed for detailed scientific and economic investigations to study the commercial viability of recovering and refining seabed minerals. Mining technology evolved to mine tin in the shallow waters off the coast of Thailand and Indonesia.[42] South Africa used new mining technologies to mine diamonds from unconsolidated sedimentary deposits off the Namibian coast.[43]

In 1965, Mero's influential study estimated that several hundred billion tonnes of mineable nodules existed in the Pacific Ocean.[44] This study helped fuel continued interest in developing a legal regime for seabed mining as the nodules began to attract commercial interest because of their metal content.[45] While Mero's estimates are overly optimistic, potentially by orders of magnitude, they captivated the United Nations General Assembly members.[46]

Malta's Permanent Representative to the United Nations, Ambassador Arvid Pardo, gave a speech in 1967 that provided for the genesis of the Common Heritage of Mankind.[47] The Common Heritage of Mankind can be considered an ethical concept that could shape a new

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[40] UN General Assembly, *Convening of a Second United Nations Conference on the Law of the Sea*, *Resolution 1307 (XIII)* of 10 December 1958; *Second United Nations Conference on the Law of the Sea*, 1960. UNCLOS II was held in Geneva from 16 March to 26 April 1960.
[41] *Final Act of the Second United Nations Conference on the Law of the Sea,* UN Doc. A/CONF.19/L.15 (April 1960).
[42] P. Aranyakanon & K. Yongsakul, "Offshore Tin Deposits of Thailand and Related Mining Problems" (1981) SG:12 Energy Resources of the Pacific Region 167.
[43] Leon Edward Moller, "Jurisdiction Over Offshore Diamond Mining" (2003) 21:2 Journal of Energy & Natural Resources Law 168.
[44] John Mero, *Geochemistry and descriptions of manganese nodules and crusts retrieved from the open ocean*, Supplement to: John Mero, The Mineral Resources of the Sea Elsevier Oceanography Series 1 (PANGAEA, 1965); John Mero, "Potential Economic Value of Ocean-Floor Manganese Deposits" in David Horn, ed, *Ferromanganese Deposits on the Ocean Floor* (Washington, D.C.: National Science Foundation, 1972).
[45] Paul Lusty & Bramley J. Murton, "Deep-Ocean Mineral Deposits: Metal Resources and Windows into Earth Processes" (2018) 14:5 Elements 301.
[46] Ole Sparenberg, "A historical perspective on deep-sea mining for manganese nodules, 1965–2019" (2019) 6:3 The Extractive Industries and Society 842.
[47] Arvid Pardo, *Address to the 22nd session of the General Assembly of the United Nations* (U.N. GAOR, 22nd sess., U.N. Doc. A/6695 (18 August 1967)). Further discussion on the Common Heritage of Mankind is set out below.

world order based on new forms of cooperation, economic theory, and philosophy.[48] Complementing the principles of the Common Heritage of Mankind requires developing States to participate in seabed mining exploration and exploitation.[49]

The Common Heritage of Mankind is codified under section 1 of the 1970 *Declaration of Principles Governing the Seabed*, declaring that the seabed is not subject to appropriation by any State, is to be used for peaceful purposes, and is to be governed by an international regime to be established in the future.[50] The 1970 *Declaration of Principles Governing the Seabed* further recognized that the high seas' existing legal regime did not provide substantive rules for regulating the exploration and the exploitation of the resources found on the seabed.[51] The *Reservation exclusively for peaceful purposes of the sea-bed and the ocean floor, and the subsoil thereof, underlying the high seas beyond the limit of present national jurisdiction and use of their resources in the interests of mankind, and convening a conference on the law of the sea (*"UNGA Reservation 2750"), attached to the declaration, reaffirmed that the development of the Area shall be undertaken to foster the healthy development of the world economy and international trade.[52] UNGA Reservation 2750 affirmed the recommendation to minimize any adverse economic effects caused by fluctuating raw material prices from seabed mining.[53] UNGA Reservation 2750 requested United Nations agencies to identify the problems arising from the

[48] Elisabeth Mann Borgese, "Arvid Pardo (1914–1999): In Memoriam" 14th ed. Ocean Yearbook xix-xxxviii.
[49] Donald Anton, "The Principle of Residual Liability in the Seabed Disputes Chamber of the International Tribunal for the Law of the Sea: The Advisory Opinion on Responsibility and Liability for International Seabed Mining [ITLOS Case No. 17]" (2012) 7:2 McGill JSDLP 241 at 245.
[50] *UNGA Declaration of Principles Governing the Sea-bed and the Ocean Floor, and the Subsoil Thereof, Beyond the Limits of National Jurisdiction UNGA Res. 2749 (XXV) (1970) section 1*; Marie Bourrel, Torsten Thiele & Duncan Currie, "The Common Heritage of Mankind as a means to assess and advance equity in deep sea mining" (2018) 95:C Marine Policy 311 at 312.
[51] *Ibid*.
[52] UNGA, *Reservation exclusively for peaceful purposes of the sea-bed and the ocean floor, and the subsoil thereof, underlying the high seas beyond the limit of present national jurisdiction and use of their resources in the interests of mankind, and convening a conference on the law of the sea*, UN Res 2750 (XXV) (1970).
[53] *Ibid.*

production of seabed minerals, examine the impact mining will have on developing countries' well-being, consider the demand and pricing for raw materials, and propose effective solutions.[54]

The 1971 *Report of the Committee on the Peaceful Uses of the Seabed and the Ocean Floor Beyond the Limits of National Jurisdiction* considered and researched the numerous conflicting positions of many nations.[55] What started as an exercise to regulate the seabed became a global diplomatic effort to regulate and write rules for the ocean and its uses and resources.[56]

The *Third United Nations Conference on the Law* of the Sea ("UNCLOS III") was held between 1973 and 1982.[57] The conference convened in New York in 1973.[58] Nations had widely differing views on developing a legal regime for the seabed. One of the fundamental issues still being negotiated was who should explore and exploit the international seabed area beyond the limits of national jurisdiction.[59] The first option was to have one central regulator acting as the operator. This option envisaged an international authority with broad powers, which would govern and control the international seabed area and would, by itself or in association with others, ensure the exploration and exploitation of resources in the international community's interest. The second option would have a seabed authority act in a more limited capacity to oversee private operators. This second option provided for an intergovernmental

[54] *Ibid* at Article A (1); Peter B Payoyo, *Cries of the sea: world inequality, sustainable development and the common heritage of humanity* (Martinus Nijhoff, 1997).
[55] UN, *Report of the Committee on the Peaceful Uses of the Sea-Bed and the Ocean Floor beyond the Limits of National Jurisdiction* UN Doc. A_8421-EN (1971).
[56] *Ibid* at 28.
[57] UN, *Third United Nations Conference on the Law of the Sea*, online: https://legal.un.org/diplomaticconferences/1973_los/#:~:text=The%20General%20Assembly%2C%20by%20resolution,of%20thirty%2Dsix%20Member%20States.
[58] *UNCLOS III, First and Second Session,* (3–15 December 1973) and Caracas, (20 June to 29 August 1974).
[59] There is the second issue of the status of the Enterprise, which would act as the ISA's operator. The Enterprise is comprehensively covered in Chapter 3, along with the other actors in seabed mining.

organization that would possess administrative status. States and private enterprises could explore and exploit the seabed under contractual arrangements.[60]

Alignments of countries at UNCLOS III tended to follow North-South divisions.[61] For example, a so-called "Group of 77" (representing over one hundred (100) developing countries) wanted a regime to help usher in a new international economic order to redistribute the world's wealth.[62] They wanted an authority with a monopoly to control and conduct all seabed mining activities.[63] The industrialized "North" wanted access via a private system to safeguard international law and free enterprise. Canada, for example, wanted to protect its mining interests, especially in nickel.[64] This led to a conflict of values between the desire to negotiate an internationally acceptable law of the sea convention and the desire to safeguard future markets for Canadian land-based nickel and protect the intellectual property of Canadian corporations.[65] The "North" wanted an authority to act as a licensing body or a regulator.[66] The United States desired a free enterprise-based system with limited regulator involvement.[67]

The first substantive outcome occurred in 1974, during UNCLOS III's Second Session, after the UN released the *Economic Implications of seabed mineral development in the international area: Report of the Secretary-General*.[68] The report investigated manganese nodules but noted that the results were extremely tentative as little scientific study was

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[60] ISA, *Legislative history of the "Enterprise" under the United Nations Convention on the Law of the Sea and the Agreement Relating to the Implementation of Part XI of the Convention*, ISA 976-610-468-9 (Jamaica, 2002) at 41.
[61] Christopher Joyner & Elizabeth Martell, "Looking back to see ahead: UNCLOS III and lessons for global commons law, Ocean Development & International Law" 27:1-2 (1996) 73.
[62] Riddell-Dixon, *supra* note 33 at 8.
[63] *Ibid* at 9.
[64] *Ibid.*
[65] Elizabeth Riddell-Dixon, "State Autonomy and Canadian Foreign Policy: The Case of Deep Seabed Mining" (1988) 21:2 Can J Pol Sci 297 at 298.
[66] *Ibid* at 299.
[67] *Ibid*.
[68] UNCLOS III, *Economic implications of sea-bed mineral development in the international area: report of the Secretary-General* A/CONF.62/25 (Montego Bay, Jamaica, 1974).

undertaken.[69] The report considered that a basic conservation approach to environmental protection should maximize a resource's long-term utilization.[70]

The Third Session of UNCLOS III in 1975 defines mineral resources as seabed minerals, oil and gas, and all other gases and liquids.[71] The draft text in 1975 proposed establishing the International Seabed Authority, which would directly conduct all activities in the area and provide basic provisions for protecting and preserving the marine environment.[72] Participants believed that successfully resolving these issues would provide the basis for resolving all other issues about the international regime and machinery.[73]

A 1977 *Informal Composite Negotiating Text* amendment set 1985 as the date to begin seabed mining.[74] The United States had thirteen essential items that they deemed significant issues with the draft texts.[75] Among these were production ceilings and floors, issues related to land-based mining, and technology transfer, as developed nations were reluctant to give up their intellectual property.[76] Developing nations lobbied for developed States to extend scientific and technical assistance to countries to effectively prevent or control marine pollution.[77] Developing countries were consistent in their demands for establishing a new international economic order to transfer wealth from the rich industrialized countries to the emerging nations of Africa, Asia, and

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[69] *Ibid* at 1.
[70] *Ibid* at 13.
[71] Chairman of the Second Committee *Informal single negotiating text*, Part I, UN Doc.A/CONF.62/WP.8/Part I at Part 1, Article 1(iv).
[72] Chairman of the Second Committee, *Informal single negotiating text*, Part III, Doc.A/CONF.62/WP.8/Part III *at* Article 22.
[73] *Ibid*.
[74] Riddell-Dixon, *supra* note 33 at 47; David Hegwood, "Deep seabed mining: alternative schemes for protecting developing countries from adverse impacts" (1982) 12:2 Georgia Journal of International and Comparative Law 173 at 178.
[75] Bernard H Oxman, "The Third United Nations Conference on the Law of the Sea: The Eighth Session (1979)" (1980) 74:1 The American Journal of International Law 1 at 5, 7.
[76] *Ibid* at 8.
[77] Payoyo, *supra* note 54 at 175.

Latin America.[78] Payne argued that developing countries were nationalizing and expropriating terrestrial properties and establishing international commodity cartels.[79] These nations intended to establish this new economic order by charging higher prices for their natural resources and believed that abundant wealth would be created through seabed mining.[80] Payne believed that this belief in the limitlessness of seabed minerals (and thus profit) would slow negotiations as Mero's estimates were unreliable.[81] The early texts assumed that companies would be mining minerals before 1985, though the technology was not commercially viable.[82]

The Eighth Session of UNCLOS III, held in 1979, further advanced seabed mining by offering a revision of the *Informal Composite Negotiating Text*.[83] A safeguard clause was incorporated to appease counties with land-based mining countries' interests.[84] This clause was intended to limit the economic impact of seabed mining on terrestrial mining activities.[85] These mining nations were unconvinced that the changes would protect land-based producers. Neither evidence, financial analysis, nor forecasting was provided by either side to support their claims.

By 1980, the issue related to the ISA's core purpose and function was unresolved.[86] There was an ongoing dispute about whether the seabed authority should be the operator and directly control and conduct the activities, as initially proposed in earlier texts, or whether it should function as an administrator.[87] Hegwood, in 1980, advocated that seabed mining's "fast-

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[78] *Ibid*.
[79] Richard J Payne, "Mining the Deep Seabed: The Political, Economic and Legal Struggle" (1978) 40:4 The Journal of Politics 933.
[80] *Ibid* at 937. Using Mero's estimates, Payne believed that Mero's estimates assumed a virtually inexhaustible supply of essential minerals.
[81] *Ibid*.
[82] Jin Jian-Cai & E Somers, "The Dual Regime for Deep Seabed Mining" (1988) 41:1 Studia Diplomatica 63–97; Bernard H Oxman, "The Third United Nations Conference on the Law of the Sea: The Tenth Session (1981)" (1982) 76:1 The American Journal of International Law 1.
[83] *UNCLOS III, Eighth Session, UN DOC A/Conf.62/WP.10/Rev.1 28 April 1979 reprinted in 18 ILM 686 (1979)*.
[84] Riddell-Dixon, *supra* note 33 at 48.
[85] *Ibid*.
[86] Oxman, *supra* note 75.
[87] *Ibid*.

approaching reality" was a source of great concern for developing countries.[88] He also noted that in 1979, six consortia (including Canadian-based INCO) were involved in seabed research and development.[89] Other seabed issues included security of contractual terms, assurances against the unilateral imposition of new burdens and restrictions, the imposition of production or price controls, and assurances against discriminatory increases in the governmental "take." This could include taxes or royalties, the right to judicial review of any adverse governmental action, and the availability of enforceable effective remedies.[90]

Tensions escalated in 1980 after the United States and Germany enacted interim domestic seabed mining legislation.[91] This legislation provided leverage for the United States and Germany in negotiations with the Group of 77, who thought these pieces of legislation would undermine the Common Heritage of Mankind and the power of a central seabed authority. However, the Reagan administration maintained that the United States continued to have problems with the negotiating text, especially the issue of technology transfer.[92]

Canadian policies have played a substantial role in shaping the new ocean regime.[93] Canada wanted to protect its valuable domestic nickel industry.[94] Canada and Australia saw a reasonable connection between marine environmental protection and stronger coastal state

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[88] Hegwood, *supra* note 74.
[89] *Ibid*.
[90] Miller & Delehant, *supra* note 23.
[91] Germany, *Act on Interim Regulation of Deep Seabed Mining 1980*, dated 16 August 1980 (English translation) (1981) International Legal Materials at 39; United States, *Deep Seabed Hard Mineral Resources Act, 1980,* Public Law 96-283, 28 June 1980, 94 Stat. 553 (30 U.S.C. 1401 et seq.), as amended to 1 July 2000; United States, *Deep Seabed Mining Regulations Affecting Pre-Enactment Explorers* 45 Fed. Reg. 226 (20 November 1980), pp. 76661-76663; United States, *Deep Seabed Mining Regulations for Exploration Licenses 1980*. 46 Fed. Reg. 45896 (15 September 1981); 15 Code of Federal Regulations, Part 970.
[92] Richard J Payne, "US Foreign Policy at Sea: National Security on the Seabed" (1983) 39:10 The World Today 393–399; Fred C Ikle, "Exchange between Expert Panel and Reagan Administration Officials on Non- Seabed-Mining Provisions of LOS Treaty V" (1985) 79:1 he American Journal of International Law 151.
[93] Barry Buzan, "Canada and the law of the sea" (1982) 11:3–4 Ocean Development & International Law 149–180; Riddell-Dixon, *supra* note 33; Riddell-Dixon, *supra* note 65.
[94] Riddell-Dixon, *supra* note 33; Riddell-Dixon, *supra* note 65.

authority.[95] The Canadian delegation was concerned that unregulated mining of seafloor nodules would result in a competitive disadvantage for Canadian nickel production and export.[96] Canada wanted to ensure that international markets from land-based mines were not threatened by subsidized or unfair competition from seabed mining.[97] Canada's position was predicated on pricing models based on a seabed mining start date in 1985. Hegwood declared that "if mining does not commence until several years after the predicted 1985 date," the world demand for the relevant minerals probably will have risen past the projected 1985 levels. If so, the impact of seabed mining may be significantly less than predicted."[98] He continues, "if the growth rate of demand changes, the projected demand will change. If demand grows faster than forecasted, the impact of seabed mining on the developing countries at any particular point in the future is likely to be lessened."[99]

2.3 United Nations Convention on the Law of the Sea

UNCLOS represents the international consensus concerning the legal framework for ocean governance and a culmination of decades of hard work.[100] UNCLOS conference chair Tommy Koh of Singapore described UNCLOS as a "constitution for the ocean."[101] On 30 April 1982, 129 nations voted in favour of UNCLOS, and there are currently 167 State Parties.[102] UNCLOS codified the obligation of States to protect and preserve the marine environment.[103] UNCLOS

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[95] *Ibid.*
[96] Buzan, *supra* note 93 at 156, 163.
[97] *Ibid* at 164.
[98] Hegwood, *supra* note 74 at 178.
[99] *Ibid* at 180.
[100] Wylie Spicer, *Canada, the Law of the Sea Treaty and International Payments: Where will the Money Come From?* SPP Research Papers 31:8 (University of Calgary: School of Public Policy, 2015) at 4; Jill Barrett & Richard Barnes, *UNCLOS as a Living Treaty* (London: British Institute of International and Comparative Law, 2016).
[101] Spicer, *supra* note 100 at 2.
[102] United Nations Convention on the Law of the Sea, *International agreement that establishes a legal framework for all marine and maritime activities*, online: https://www.unclos.org/.
[103] *United Nations Convention on the Law of the Sea* 1833 UN Treaty Series 397, 1982 at Articles 3, 57, 76, 194, Part XI.

does not define the term marine environment, yet it does define pollution of the marine environment.[104] Generally, the marine environment comprises the sea's surface, the water column, the seabed beyond the high tide mark, and the relevant biosystems within this area.[105] UNCLOS Article 145 states that necessary measures shall be taken with respect to activities in the Area to ensure effective protection of the marine environment from harmful effects that may arise from such activities. To this end, the ISA shall adopt appropriate rules, regulations and procedures for the prevention, reduction and control of pollution and other hazards to the marine environment, including the coastline, and of interference with the ecological balance of the marine environment, with particular attention being paid to the need for protection from harmful effects of such activities as drilling, dredging, excavation, disposal of waste, construction and operation or maintenance of installations, pipelines and other devices related to such activities.[106] Article 235 of the Convention adds:

> 1. States are responsible for the fulfilment of their international obligations concerning the protection and preservation of the marine environment. They shall be liable in accordance with international law.
> 2. States shall ensure that recourse is available in accordance with their legal systems for prompt and adequate compensation or other relief in respect of damage caused by pollution of the marine environment by natural or juridical persons under their jurisdiction.
> 3. With the objective of assuring prompt and adequate compensation in respect of all damage caused by pollution of the marine environment, States shall cooperate in the implementation of existing international law and the further development of international law relating to responsibility and liability for the assessment of and compensation for damage and the settlement of related disputes, as well as, where appropriate, development of criteria and procedures for payment of adequate compensation, such as compulsory insurance or compensation funds.

[104] *Ibid* at Article 1(1)(4). Pollution of the marine environment means the introduction by man, directly or indirectly, of substances or energy into the marine environment, including estuaries, which results or is likely to result in such deleterious effects as harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities.
[105] Gregory D Pendleton, "State responsibility and the high seas marine environment: a legal theory for the protection of seamounts in the global commons" (2005) 14:2 Pacific Rim Law & Policy Journal 485 at 498.
[106] *UNCLOS*, *supra* note 104 at Article 145.

UNCLOS also codified the Common Heritage of Mankind.[107] Article 140(1) reiterates that activities in the Area shall be carried out for the benefit of mankind as a whole, irrespective of the geographical location of States, whether coastal or land-locked and taking into particular consideration the interests and needs of developing States and of peoples who have not attained full independence or self-governing status.[108] Coastal States retain rights and responsibilities where seabed minerals are located within their national jurisdictions.[109] Article 137 of UNCLOS states:

> 1. No State shall claim or exercise sovereignty or sovereign rights over any part of the Area or its resources, nor shall any State or natural or juridical person appropriate any part thereof. No such claim or exercise of sovereignty or sovereign rights nor such appropriation shall be recognized.
> 2. All rights in the resources of the Area are vested in mankind as a whole, on whose behalf the Authority shall act. These resources are not subject to alienation. However, the minerals recovered from the Area may only be alienated in accordance with this part and the Authority's rules, regulations, and procedures.
> 3. No State or natural or juridical person shall claim, acquire or exercise rights with respect to the minerals recovered from the Area except in accordance with this part. Otherwise, no such claim, acquisition or exercise of such rights shall be recognized.[110]

2.4 The Preparatory Commission and the 1980s

UNCLOS did not entirely mitigate Canada's concerns, including those of its nickel and copper mining industry.[111] Nor did it mitigate the concerns of several other nations, including the United States. Dissatisfaction with several provisions of UNCLOS was a primary reason for its rejection by the United States and several other industrialized States in 1982.[112] The resistance of the United States (and one reason why they are not a part of UNCLOS) was due to several provisions perceived as contrary to their commercial interests, especially those on the transfer of

[107] *Ibid* at Article 136.
[108] *Ibid* at Article 140(1).
[109] Michael Lodge, Hannah Lily & Philip Symonds, "Legal Rights to Deep Sea Minerals" in Elaine Baker & Yannick Beaudoin, eds, *Deep Sea Minerals and the Green Economy* (Secretariat of the Pacific Community, 2013) at 12.
[110] *UNCLOS*, *supra* note 104 at Article 137.
[111] Buzan, *supra* note 93 at 164-166.
[112] Satya Nandan, Lodge, Michael & Shabtai Rosenne, *The Development of the Regime for Deep Seabed Mining* (Center for Oceans Law and Policy: University of Virginia, 2002) at 13.

technology.[113] Developed countries feared the technology transfer within seabed mining would create an unfavourable precedent.[114]

The *Preparatory Commission for the International Seabed Authority and the International Tribunal for the Law of the Sea* ("PrepCom") aimed to ensure the early effective operation of the ISA.[115] Due to the global recession in the early 1980s, market prices for the metals derived from the manganese nodules were at a nadir.[116] PrepCom was empowered to register qualified applicants as "pioneer investors," entities that had invested at least $30 million. These investors included France, India, Japan, the USSR, Germany, Japan, the United Kingdom, and the United States.[117] Belgium, Canada, Italy, and the Netherlands were recognized as "pioneer" States but only as potential pioneer investors.[118]

In 1986, *the statement on the Implementation of Resolution II* allowed the accommodation of all the seabed mining entities' interests, including certifying states and potential signatories.[119] Hayashi argues that this statement required a flexible interpretation and modification of UNCLOS.[120] This allowed the Soviet Union, the United States, and other

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[113] B Jacobs, "The Future of Energy: Lunar Resource Management and the Common Heritage of Mankind" (2012) 24:2 Georgetown International Environmental Law Review 221.
[114] *Ibid* at 230; Aldo Chircop, "Managing Adjacency: Some Legal Aspects of the Relationship Between the Extended Continental Shelf and the International Seabed Area" (2011) 42:4 Ocean Development & International Law 307.
[115] UN, *Preparatory Commission for the International Seabed Authority and for the International Tribunal for the Law of the Sea* (New York, 1988) Report of the Chair Doc. LOS/PCN/L.67.
[116] Conrad G Welling, "Mining of the deep seabed in the year 2010 (Symposium: Law of the Sea)" (1985) 45:6 Louisiana Law Review 1267.
[117] S. Ranganathan, "Pioneer investor provisions of Resolution II" in *Strategically Created Treaty Conflicts and the Politics of International Law* (Cambridge University Press, 2014) at 374-375.
[118] *Consultations of the Secretary-General on outstanding issues relating to the deep seabed mining provisions of the United Nations Convention on the Law of the Sea Forty-eighth session Agenda item 36*, UNGA A/48/950 (1994); *Preparatory Commission for the International Seabed Authority and for the International Tribunal for the Law of the Sea, Eleventh session*, LOS/PCN/L.113/Rev.1 (Kingston, Jamaica, 1993); Spicer, *supra* note 100 at 3; Moritaka Hayashi, "Registration of the First Group of Pioneer Investors by the Preparatory Commission for the International Seabed Authority and for the International Tribunal for the Law of the Sea" (1989) 20:1 Ocean Development & International Law 1 at 2.
[119] *Statement on the Implementation of Resolution II*, U.N. DOC LOS/PCN/L.41/Rev.1, Annex, (11 September 1986) reprinted in 25 I.L.M. 1326 (1986).
[120] Hayashi, *supra* note 118 at 19.

"Western" nations, whether signatories or not, to proceed to a more detailed technical analysis and plan of work and allowed the registration of the four original pioneer investors.[121] Japan and several countries joined a *Provisional Understanding Regarding Deep Seabed Matters*, which the Group of 77 developing nations criticized as not conforming to UNCLOS.[122] Japan's unique traits backed up its argument that it needed a different system. First, Japan has few natural mineral resources and relies on imports to supply the four crucial minerals in manganese nodules. Second, Japan's history and culture rely on the ocean. Third, its democratic and financial systems traditionally have ties between the government and private industry.[123] Finally, Japan had expended considerable resources in the early development of the seabed and wanted to ensure that it would continue to be a pioneer investor.[124]

PrepCom also had to solve several other issues that arose in the 1980s. Due to changes in market conditions, the global recession caused a drastic reduction of interest in recovering minerals contained in manganese nodules. The international minerals market, especially copper and nickel, fluctuated and, coupled with technological factors, production costs, and other features, influenced the forecasts and assumptions for the commencement of seabed mining. PrepCom had to determine if three important holdouts, the United States, the United Kingdom, and the Federal Republic of Germany, would sign on to the UNCLOS.[125]

By the end of the 1980s, nickel prices averaged a six to seven percent annual compounded growth rate, and the world population and industrial development increased.[126] Welling notes that historical cycles of mineral production indicate that by the year 2010, there

[121] Spicer, *supra* note 100 at 3; Hayashi, *supra* note 118.
[122] Moritaka Hayashi, "Japan and deep seabed mining" (1986) 17:4 Ocean development and international law 351–365 at 352.
[123] *Ibid* at 355.
[124] *Ibid* at 358.
[125] Hayashi, *supra* note 118 at 23.
[126] Welling, *supra* note 116 at 1268.

exists a speculative probability that manganese nodule mining should be well established, but extensive scientific ocean floor exploration is necessary for commercial development.[127] Regarding manganese crusts, the commercial viability was mere speculation, adding that deep ocean mining technology development is out of the laboratory and is awaiting the pilot plant stage.[128] It was commented that:

> there are many provisions of the Law of the Sea Treaty that make it exceedingly difficult, if not impossible, to raise the necessary risk capital in the free world to develop the deep seabed under the proposed Deep Seabed Authority. These provisions make freedom of access to markets practically impossible.[129]

Orrego Vicuna adds, "seabed minerals has not been as imminent a prospect as had been thought since many of the plans to go ahead have been deferred."[130] Adding:

> A regime of this nature is liable to be always out of step with the real-life situation it purports to regulate. The outline framework approach is more flexible in that it can guarantee both the requisite security and legal stability and clarity in regard to the operators' rights and obligations.[131]

It was becoming apparent that there is an interrelationship between markets, pricing and technology that can be difficult, if not impossible, to define with reasonable accuracy. As such, prospects for commercial mining of seabed minerals had receded into the next century, contrary to the expectations held during UNCLOS III.

From 1990 to 1991, participation in PrepCom's first phase was restricted to thirty (30) key players,[132] including the three central non-signatory States, Germany, the United States and the United Kingdom.[133] These early consultations identified nine issues representing areas of difficulty in the seabed mining regime, including costs to State Parties, the Enterprise, decision-

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[127] *Ibid* at 1269.
[128] *Ibid* at 1271.
[129] UNGA *Resolution 11, UN Doc. LOS/PCN/97* (1988); Welling, *supra* note 116 at 1272.
[130] Francisco Orrego Vicuña, "The deep seabed mining regime: Terms and conditions for its renegotiation" (1989) 20:5 Ocean Development and International Law 531 at 531.
[131] *Ibid* at 537.
[132] UNCLOS, *supra* note 104 at 351.
[133] The non-participation of the US, and the reserved positions of the UK, Germany initially precluded any role of the PrepCom to make Part XI of UNCLOS acceptable; Michael Wood, "International Seabed Authority: the First Four Years" (1999) Max Planck UNYB 3 at 178.

making of the authority, technology transfer, production limitation, compensation funds, financial terms of the contract, and environmental considerations.[134] In July 1991, invited delegates examined the first issue, costs to States. The Secretariat's Information Note predicted that the ISA would not be expected to deal with commercial seabed mining activities for at least ten to fifteen years.[135] This allowed time to proceed with negotiations. The next informal consultations were devoted to four issues: production limitations, compensation funds, financial terms of contracts, and environmental considerations. It was agreed that formulating a new set of detailed rules for these items was neither necessary nor prudent.[136] During the 1992 consultations, it was decided to remove the "environmental considerations" issue from the list of issues to be dealt with since it was no longer considered an important issue in deep seabed mining.[137] According to Markussen, "the general attitude amongst participants at the informal consultations held in August 1992 was that the environmental consequences would be manageable.[138] Parties, many of whom were signatories to UNCLOS, did not agree that:

> The regime established by the Convention and related resolutions was "the only regime" for exploring and exploiting the area and its resources because the Convention regime would become binding only on its parties and only after it entered into force. They also took exception to the argument underlying the declaration that the claim, agreement, or action concerned was illegal since it was contrary to the principle of the common heritage of humankind, pointing out that General Assembly resolution 2749 (XXV), enunciating the common heritage principle, clearly stated that based on that and other principles an international regime shall be established by "an international treaty of a universal character, generally agreed upon." For those delegations, such a treaty had not been achieved, given their objection and reservations regarding certain aspects of the Convention. [139]

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[134] *Ibid.*
[135] UNGA, *supra* note 129 at 164.
[136] *Ibid* at 165.
[137] Jan Magne Markussen, "Deep seabed mining and the environment: consequences, perceptions, and regulations" (1994) 31 Green globe yearbook of international co-operation on environment and development 33.
[138] LDM Nelson, "The New Deep Sea-Bed Mining Regime" (1995) 10:2 International Journal of Marine and Coastal Law 189; Markussen, *supra* note 255 at 31.
[139] Rob Huebert, "Canada and the Law of the Sea Convention" (1997) 52:1 International Journal 69 at 77–78; Hayashi, *supra* note 118 at 14.

2.5 Agreement relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982

UNCLOS did not entirely mitigate the concerns of the developed world, including those related to mining for nickel and copper.[140] In 1994, the *Agreement relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982* (the "*1994 Agreement*") modified UNCLOS to be more market friendly. This *1994 Agreement* provided a stable environment for investors in deep seabed minerals under a market-oriented regime, guaranteed access to the seabed resources to all qualified investors, provided for the establishment of a 'fair' system of taxation, and benefited the international community as a whole.[141] It included provisions for assisting developing land-based mineral producers whose economies may be affected due to deep seabed mining.[142] Article 311 of UNCLOS enshrined that no derogation of the principle of the Common Heritage of Mankind can apply to any actors within seabed mining.[143] There is an argument that the *1994 Agreement* was meant to introduce substantial amendments or adjustments to the common heritage regime.[144]

The *Annex to the 1994 Agreement* modifies the function and organization of the ISA. Annex, section 1 reads that the ISA will organize and control activities in the Area, particularly with a view to administering its resources. Annex Section 5 states that the ISA should initially concentrate on processing applications for approval of exploratory plans of work, monitoring compliance with approved plans of work, drafting contracts for exploratory plans of work and

[140] Buzan, *supra* note 93 at 165, 166.
[141] *Agreement relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982*, 1994 at Annex, s. 8; David Johnson, *Periodic Review of the International Seabed Authority pursuant to UNCLOS Article 154 – Interim report* (2016); Isabel Feichtner, "Sharing the Riches of the Sea: The Redistributive and Fiscal Dimension of Deep Seabed Exploitation" (2019) 30:2 EJIL 601–633; Nandan, Lodge, Michael & Rosenne, *supra* note 112 at 14.
[142] Joanna Dingwall, *International Law and Corporate Actors in Deep Seabed Mining* (Oxford University Press, 2021) at 85.
[143] *UNCLOS*, *supra* note 104 at Article 311.
[144] Payoyo, *supra* note 54 at 7.

adopting rules, regulations and procedures necessary for the conduct of activities in the Area as they progress.[145] The ISA shall review trends and developments in seabed mining activities, including conducting a timely analysis of world metal market conditions and prices, and study the potential impact of mineral production from the Area on the economies of developing land-based producers, likely to be most seriously affected. The goal would be minimizing difficulties and assisting developing States in their economic adjustment.[146] The priority is to timely adopt rules, regulations and standards for protecting and preserving the marine environment and emphasizing research related to environmental impact.[147]

The Annex in the *1994 Agreement* contains a provision recently triggered by Nauru.[148] Section 15 mandates that the ISA shall elaborate and adopt, under UNCLOS Article 162(o)(ii), additional rules, regulations and procedures necessary to facilitate the approval of plans of work for exploration or exploitation. The ISA was granted the time to undertake to create all or any of such rules, regulations or procedures required for the conduct of activities in the Area unless commercial exploitation is "imminent" or if a State whose national intends to apply for approval of a plan of work for exploitation makes a request.[149] If a State makes such a request, the ISA's Council shall complete the adoption of such rules, regulations, and procedures within two years of the request.[150] If the Council has not completed the rules, regulations and procedures relating

[145] *1994 Agreement*, *supra* note 141 at Annex s. 5(g).
[146] *Ibid* at Annex, s 5(e).
[147] *Ibid* at Annex, s. 5(g-k).
[148] Helen Reid & Jeff Lewis, "Deep-sea mining rules to be fast-tracked in push from Nauru" (29 June 2021) Reuters online: https://www.reuters.com/business/environment/exclusive-deep-sea-mining-rules-be-fast-tracked-push-nauru-source-2021-06-25/; Kate Lyons, "Deep-sea mining could start in two years after Pacific nation of Nauru gives UN ultimatum" (30 June 2021) Guardian Online: https://www.theguardian.com/world/2021/jun/30/deep-sea-mining-could-start-in-two-years-after-pacific-nation-of-nauru-gives-un-ultimatum; Seas at Risk, "Nauru and DeepGreen trigger mechanism to start deep-sea mining in two years" online: https://seas-at-risk.org/general-news/nauru-and-deepgreen-trigger-mechanism-to-start-deep-sea-mining-in-two-years/.
[149] *1994 Agreement*, *supra* note 141 at Annex, s. 15(a).
[150] *Ibid* at Annex, s. 15(b).

to exploitation within the prescribed time and an application for approval of a plan of work for exploitation is pending, the ISA must provisionally approve plans of work, subject to any rules, regulations and procedures that have been adopted, based on the norms contained in UNCLOS, international law, the terms and principles contained in the Annex, and the principle of non-discrimination among contractors.[151]

2.6 The International Seabed Authority

UNCLOS, Part XI, created the ISA to administer and regulate seabed mining activities.[152] This departed from the original intent to act as the sole operator. UNCLOS mandated that the ISA provide for the equitable sharing of financial and other economic benefits derived from activities in the Area through any appropriate mechanism on a nondiscriminatory basis.[153] The ISA must develop the necessary rules, regulations, and procedures to secure effective protection of the marine environment from harmful effects directly resulting from activities in the Area or shipboard processing immediately above a mine site of minerals derived from that mine site.[154] The provision adds that the ISA must consider the extent to which such harmful effects may directly result from drilling, dredging, coring and excavation and disposal, dumping and discharge into the marine environment of sediment, wastes or other effluents.[155]

Comprised of 168 Member States, the ISA has three 'bodies' or divisions: the Assembly (supreme body), the Council (executive body), and the Legal and Technical Commission ("LTC").[156] The ISA Assembly comprises all its Member States and is responsible for setting general policies and regularly reviewing the executive's work. The Council is the executive body

[151] *Ibid* at Annex, s. 15(c).
[152] *UNCLOS*, *supra* note 104 at Article 156, Part XI.
[153] *Ibid* at Article 140(2).
[154] *Ibid* at Article 160.
[155] *Ibid*.
[156] ISA, "Organs of the International Seabed Authority", online: https://www.isa.org.jm/organs.

of the ISA and establishes policies and approves applications for exploration or exploitation rights. The Assembly elects the Council's thirty-six (36) members for rotating four (4) year terms, according to a formula intended to represent geographical regions and groups with special economic interests related to seabed mining.[157] The Council consists of 36 members elected by the Assembly in the following order:

a) Four members from among those States Parties which have either consumed more than 2 percent in value terms of total world consumption or have had net imports of more than 2 percent in value terms of total world imports of the commodities produced from the categories of minerals to be derived from the Area, provided that the four members shall include one state from the Eastern European region having the largest economy in that region,
b) Four members from among the eight States Parties which have made the largest investments in preparation for and the conduct of activities in the Area, either directly or through their nationals,
c) Four members from among States Parties which, based on production in areas under their jurisdiction, are major net exporters of the categories of minerals to be derived from the Area, including at least two developing States whose exports of such minerals have a substantial bearing upon their economies,
d) Six members from among developing States Parties, representing special interests. The special interests to be represented shall include those of States with large populations, States which are land-locked or geographically disadvantaged, island States, States which are major importers of the categories of minerals to be derived from the Area, States which are potential producers for such minerals and least developed States,
e) Eighteen members elected according to the principle of ensuring an equitable distribution of seats, provided each geographical region shall have at least one member elected. The geographical regions shall be Africa, Asia, Eastern Europe, Latin America and the Caribbean and Western Europe and Others.[158]

The Council's task is to draw up the terms of contracts, approve contract applications, oversee the implementation of the contracts, and establish environmental standards.[159] Other functions of the Council include approving plans of work, exercising control over activities in the Area, supervising and coordinating the implementation of UNCLOS's seabed provisions, issuing emergency orders to prevent environmental damage, and adopting (pending approval by the Assembly) the rules, regulations and procedures by which the Authority controls prospecting, exploration and exploitation in the Area.[160]

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[157] *UNCLOS*, *supra* note 104 at Article 161(1); Deep Sea Mining Campaign, *Why the Rush? Seabed Mining in the Pacific Ocean* (Mining Watch Canada, 2019) at 18.
[158] ISA, *Composition of the First Council of the International Seabed Authority* (21 March 1996) Doc. ISBA/A/L.8.
[159] *UNCLOS*, *supra* note 104 at Article 162; ISA, *Delegates Handbook 2018* (Kingston, Jamaica: ISA, 2018) at 14.
[160] *Ibid*.

Article 162(2) of UNCLOS provides the Council with the power to recommend to the Assembly any rules, regulations and procedures on the equitable sharing of financial and other economic benefits derived from activities in the Area and the payments and contributions made, taking into particular consideration the interests and needs of the developing nations.[161] The ISA Assembly shall also adopt and apply rules, regulations, and procedures relating to prospecting, exploration and exploitation in the Area. Priority shall be given to adopting rules, regulations, and procedures for exploring and exploiting polymetallic nodules. The Assembly must further consider how such harmful effects may directly result from drilling, dredging, coring and excavation and the disposal, dumping and discharge into the marine environment of sediment, wastes or other effluents.[162] Rules, regulations, and procedures for exploring and exploiting any resource other than polymetallic nodules shall be adopted within three years from the date of a request to the ISA by any of its members.[163]

The LTC advises the Council and holds meetings in closed sessions.[164] The ISA faces challenges concerning the increasing demands for greater transparency and accountability of its operations, including stakeholder participation and the lack of publicly available data. [165]

[161] *Ibid* at Article 162(o)(i).
[162] *Ibid* at Article 160.
[163] *Ibid* at Article 162(o)(ii).
[164] Thompson et al, *supra* note 24 at 3.
[165] Aline Jaeckel, "Deep seabed mining and adaptive management: The procedural challenges for the International Seabed Authority" (2016) 70 Marine Policy 205–211; Aline L Jaeckel, *The International Seabed Authority and the Precautionary Principle: Balancing Deep Seabed Mineral Mining and Marine Environmental Protection* (Boston: Boston : Brill Nijhoff, 2017); Aline Jaeckel, "An Environmental Management Strategy for the International Seabed Authority? The Legal Basis" (2015) 30:1 The International Journal of Marine and Coastal Law 93–119; Aline Jaeckel, Jeff A Ardron & Kristina M Gjerde, "Sharing benefits of the common heritage of mankind – Is the deep seabed mining regime ready?" (2016) 70:C Marine Policy 198–204; Jennifer M Durden et al, "Environmental Impact Assessment process for deep-sea mining in 'the Area'" (2018) 87:C Marine Policy 194–202.

Enhanced practices in transparency could lead to improved accountability in seabed mining governance.[166] The ISA acknowledges the lack of transparency around its decision-making.[167]

If serious harm to the marine environment occurs, the ISA is potentially liable for the actual amount of any damage, including damage to the marine environment arising out of its wrongful acts or omissions. UNCLOS, Annex III, Article 22, provides that the ISA shall have responsibility or liability for any damage arising out of wrongful acts in exercising 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. The ISA will indemnify parties against all claims and liabilities from its wrongful acts or omissions.[168] However, the ISA could veto a decision to begin a claim against a contractor or Sponsoring State for damages or order remediation and restoration of the affected area.[169] A Member State may initiate proceedings against the ISA for failure to supervise activities, such as failure to conduct inspections.[170] If the ISA is liable for damages, funding issues and the ability to pay a claim become apparent, as the ISA may have insufficient funds to pay such claims.[171]

The ISA acts as a quasi-financial regulator by setting and collecting fees, royalties and guarantee payments.[172] The ISA must review the collection of all payments made by or to it in

[166] Jeff A Ardron, "Transparency in the operations of the International Seabed Authority: An initial assessment" (2018) 95:C Marine Policy 324–331; Jeff A Ardron, Henry A Ruhl & Daniel OB Jones, "Incorporating transparency into the governance of deep-seabed mining in the Area beyond national jurisdiction" (2018) 89:C Marine Policy 58–66.
[167] Johnson et al, *supra* note 141 at 79.
[168] *Decision of the Assembly of the International Seabed Authority relating to the regulations on prospecting and exploration for polymetallic sulphides in the Area*, at Annex IV, s. 16; *2019 Draft Regulations on Exploitation of Mineral Resources in the Area (2019), ISBA/25/C/WP1* at Regulation 7.4.
[169] Davenport, *supra* note 19 at 10.
[170] *UNCLOS*, *supra* note 104 at Article 153.
[171] Funding and capitalization of the ISA will be analyzed in Chapters 5 and 6.
[172] Davenport, *supra* note 19 at 9; Tara Davenport, *Responsibility and Liability for Damage Arising Out of Activities in the Area: Attribution of Liability*, CIGI Report 4 (CIGI, 2019) at 7; Tara Davenport, *Possible Forums for Liability Claims Arising from Deep Seabed Mining: Problems & Prospects* (Kingston, Jamaica, 2019).

connection with operations and select from among applicants for production authorizations.[173] Thus, drafting financial rules, regulations and procedures relating to financial management and arrangements is paramount.[174]

The ISA came into existence on 16 November 1994 and became fully operational as an autonomous international organization in June 1996. Nelson noted that a transformation in the general economic climate due to a growing reliance on market principles occurred in the mid-1990s.[175] Despite the important *United Nations Conference on Environment and Development* held in Rio in 1992, the environment continued to take a back seat to economic activities in the early work of the ISA.[176]

The First and Second Sessions of the ISA largely focused on procedural and administrative matters, such as rules of procedure, membership, budgets, and authorization functions.[177] The Third Session dealt with membership issues and included a statement describing the status of implementing the obligations of South Korea, a Registered Pioneer Investor.[178] This session included a report by the LTC on requests for plans of work by several

[173] *UNCLOS*, *supra* note 104 at Article 162(p).
[174] *Ibid* at Article 162(2)(y).
[175] Nelson, *supra* note 138.
[176] See Chapter 6, *infra* for analysis of the environmental and social dimensions in International Sustainable Development Law.
[177] ISA, *1st Session of the International Seabed Authority*, online: https://www.isa.org.jm/sessions/1st-session-1994-1995 and ISA, *Second session of the International Seabed Authority*, online: https://www.isa.org.jm/node/501/session/assembly#block-media-2 for a list of documents.
[178] ISA, *Third Session of the International Seabed Authority, online:* https://www.isa.org.jm/sessions/3rd-session-1997; ISA, *Statement describing the status of the implementation of the obligations by the Registered Pioneer Investor, the Government of the Republic of Korea and its certifying State, the Republic of Korea, under Resolution II and the related understanding adopted by the General Committee of the Preparatory Commission for the International Seabed Authority and for the International Tribunal for the Law of the Session* 12 August 1994 Doc. ISBA/3/C/6.

States.[179] The ISA was granting plans of work prior to the existence of any regulations on exploration or any policies for environmental protection.[180]

2.6.1 The Mining Code and Exploration

The ISA is currently developing the *Mining Code*, the entire set of rules, regulations, and procedures to regulate the prospecting, exploration, and exploitation of marine minerals in the international seabed area.[181] UNCLOS contains broad environmental protections; however, the *Mining Code* provides the regulatory environment for liabilities and financial terms. In addressing Council powers, UNCLOS Article 162(2)(o)(ii) prioritizes the adoption of rules, regulations and procedures for seabed mining.

The Fourth Session of the ISA included the presentation of the *Draft Regulations on Prospecting and Exploration for Polymetallic Nodules in the Area: Proposed by the Legal and Technical Commission.*[182] This draft contained provisions for plans of work, certificates of sponsorship, financial and technical capabilities, undertakings, the data required to submit an application for exploration in a reserved area, fees, and contracts for exploration.[183] It also contained provisions for responsibility and liability and protecting the marine environment.[184]

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[179] ISA, *Report and Recommendation of the Legal and Technical Commission concerning the Request for Approval of Plans of Work for Exploration by the Government of India, the Institut Française pour l'Étude et la recherché des nodules (France), Deep Ocean Resources Development Co., Ltd (Japan), Yuzhmorgeologiya (Russian Federation), China Ocean Mineral Resources Research and Development Association (China), Interoceanmetal Joint Organization (Bulgaria, Cuba, Czech Republic, Poland, Russian Federation and Slovakia) and the Government of the Republic of Korea* Doc. ISBA/3/C/7 and ISBA/3/C/9.
[180] *Decision of the Assembly of the International Seabed Authority concerning the Financial Regulations of the International Seabed Authority* Doc. ISBA/6/A/3* (28 March 2000).
[181] ISA, *Making the Most of Deep Seabed Mineral Resources: Developing Financial Terms for Deep Sea Mining Exploitation, Working Paper* (2014).
[182] ISA, *Draft regulations on Prospecting and Exploration for Polymetallic Nodules in the Area: Proposed by the Legal and Technical Commission*, ISBA/4/C/4 Rev. 1 https://isa.org.jm/files/files/documents/isba-4c-4rev1.pdf
[183] *Ibid* at Regulations 3, 7, 9, 10, 15, 16, 20
[184] *Ibid* at Regulations 27 and 28.

The ISA published the proceedings of a workshop on environmental guidelines.[185] The *Protocol on Privileges and Immunities of the International Seabed Authority* was adopted by consensus on 26 March 1998 as part of the ISA's Fourth Session.[186] This protocol allows the ISA to contract, acquire property, and be a party in legal proceedings. Notably, the protocol gives immunity to ISA members and officials from the legal process regarding words spoken or written and all acts performed by them in the exercise of their functions. However, exemptions occur when a member expressly waives this immunity in a particular case. Importantly, it does not create immunities for liabilities for damage resulting from seabed mining.

The ISA's Fifth Session provided recommendations on developing guidelines for assessing the possible environmental impacts of exploring polymetallic nodules in the Area. It updated *Draft Regulations on Prospecting and Exploration for Polymetallic Nodules in the Area*.[187] The Sixth Session approved the final *Regulations on Prospecting and Exploration for Polymetallic Nodules in the Area*.[188]

The final *Regulations on Prospecting and Exploration for Polymetallic Nodules* in the Area were adopted on 13 July 2000.[189] According to these regulations, each application shall contain sufficient data and information concerning the area under the application.[190] Financial requirements require that each application for approval of a plan of work for exploration contain specific and sufficient information to enable the ISA Council to determine whether the applicant

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[185] ISA, *Deep Seabed Polymetallic Nodule Exploration: Development of Environmental Guidelines*, (1-5 June 1998).
[186] *Protocol on the Privileges and Immunities of the International Seabed Authority*, by ISA, ISBA/4/A/8 (1998).
[187] ISA, *Fifth Session of the International Seabed Authority, online:* https://www.isa.org.jm/sessions/5th-session-1999.
[188] ISA, *Decision of the Assembly relating to the regulations on prospecting and exploration for polymetallic nodules in the Area* ISBA/6/A/18.
[189] *Decision of the Assembly of the International Seabed Authority relating to the Regulations on Prospecting and Exploration for Cobalt-rich Ferromanganese Crusts in the Area*; *Decision of the Assembly of the International Seabed Authority relating to the regulations on prospecting and exploration for polymetallic sulphides in the Area*.
[190] This information is necessary to enable the ISA Council to designate a reserved area based on the estimated commercial value of each part.

is financially and technically capable of carrying out the proposed plan of work for exploration and fulfilling its financial obligations. A registered pioneer investor requesting approval of a plan of work for exploration shall be considered to have satisfied the financial and technical qualifications necessary to approve a plan of work.[191] Applicants other than a registered pioneer investor shall include a declaration by the State or the Sponsoring State certifying that the applicant has the necessary financial resources to meet the estimated costs of the proposed plan of work for exploration.[192] All applications shall include:

a. A general description of the applicant's previous experience, knowledge, skills, technical qualifications and expertise relevant to the proposed plan of work for exploration;
b. A general description of the equipment and methods expected to be used in carrying out the proposed plan of work for exploration and other relevant non-proprietary information about the characteristics of such technology; and
c. A general description of the applicant's financial and technical capability to respond to any incident or activity which causes serious harm to the marine environment.[193]

Such data and information shall consist of data available to the applicant concerning both parts of the area under application, including the data used to determine their commercial value.[194] There are certain areas specifically reserved for developing States.

The Eighth and Ninth Sessions developed regulations for polymetallic massive sulphide deposits and cobalt-rich ferromanganese crusts.[195] The Tenth Session first published the *Draft Regulations on Prospecting and Exploration for Polymetallic Sulphides and Cobalt-rich Ferromanganese Crusts* in the Area. In contrast, the Eleventh, Twelve and Thirteenth Sessions provided more context and recommendations on these draft regulations.[196] Finally, Sessions

[191] *Draft Exploitation Regulations*, *supra* note 168 at Regulation 12.
[192] *Ibid* at Regulation 12(4).
[193] *Ibid* at Regulation 12(5).
[194] *Ibid* at Regulation 16.
[195] ISA, *Summary presentations on polymetallic massive sulphides deposits and cobalt-rich ferromanganese crusts* ISBA/8/A/1/Corr.1 https://isa.org.jm/files/files/documents/isba-8a-1corr1.pdf
[196] *Recommendations of the workshop on polymetallic sulphides and cobalt crusts: their environment and considerations for the establishment of environmental baselines and an associated monitoring programme for exploration* ISBA/11/LTC/2; *Analysis of the draft regulations on prospecting and exploration for polymetallic*

Fourteen to Eighteen continued to update the draft regulations on exploration and provide additional reports.[197]

The final text of the *Regulations on Prospecting and Exploration for Polymetallic Sulphides in the Area* was adopted on 7 May 2010.[198] The sulphides regulations added a provision for marine environmental protection during prospecting activities.[199] The *Regulations on Prospecting and Exploration for Cobalt-Rich Crusts* were adopted on 27 July 2012.[200] The content is largely the same as the sulphides regulations.[201] The *Nodules Regulations* were updated and adopted on 25 July 2013 to align with the sulphides and crusts regulations.[202] In addition, regulation five (5) on protecting and preserving the marine environment during prospecting was added, and financial capabilities were updated.[203] As of 15 May 2022, the ISA has issued regulations on the exploration of polymetallic nodules, polymetallic sulphides, and cobalt-rich crusts.[204]

2.6.2 The Mining Code and Exploitation

Session Nineteen of the ISA, held from 15-26 July 2013, first considered exploitation activities.[205] These initial discussions largely derived their recommendations from land-based

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sulphides and cobalt-rich ferromanganese crusts in the Area. Part I: ISBA/12/C/2 (8 June 2006); *Analysis of the draft regulations on prospecting and exploration for polymetallic sulphides and cobalt-rich ferromanganese crusts in the Area; Part II: Provisions relating to the protection of the marine environment* ISBA/12/C/2 Part II (8 June 2006); ISA, The 13th Session of the International Seabed Authority online: https://www.isa.org.jm/sessions/13th-session-2007/.

[197] *Twelfth Session of the International Seabed Authority,* online: https://www.isa.org.jm/index.php/sessions/12th-session-2006.

[198] P*olymetallic Sulphides Regulations supra note 196*.

[199] *Ibid* at Regulations 5 and 13.

[200] *Cobalt-rich Ferromanganese Crusts Regulations*, *supra* note 196.

[201] *Ibid*.

[202] ISA, *Regulations on Prospecting and Exploration for Polymetallic Nodules in the Area Proposed by the Legal and Technical Commission* ISBA/19/C/WP.1 and ISBA/19/C/L.1.

[203] *Ibid* at Regulation 5 and 12.

[204] Nodules Regulations, *supra* note 196; Coba*lt-rich Ferromanganese Crusts Regulations, supra note 196; Polymetallic Sulphides Regulations, supra note 196*.

[205] ISA, *Towards the Development of a Regulatory Framework for Polymetallic Nodule Exploitation in the Area, Technical Study 11 (28 June 2013),* ISBA/19/C/5.

mining regimes.[206] A 2013 ISA report noted that some of the major issues of land-based regulation would translate to regulating the exploitation of polymetallic nodules.[207] The LTC recommended that an analysis of the factors that differentiate the regulation of deep ocean mining from its land-based counterparts be conducted.[208] They noted that issues, including the current status of exploration, environmental concerns, unique technical and logistical challenges, the absence of traditional mine site communities, and the relative strength and stability of the ISA as a regulator, significantly differ from land-based mining.[209] In addition, some differences will result from shifts in the risks inherent in exploiting polymetallic nodules under the UNCLOS compared to those under land-based operations.[210] Early studies also did not consider any environmental protections.[211] It was recommended that a change in the regulatory regime's focus, form, and substance, compared to land-based mining, occur.[212]

The First Working Draft of the Exploitation Regulations and Standard Contract Terms was released in 2016.[213] In 2017, the ISA released the *Initial Draft Regulations on Exploitation of Mineral Resources in the Area*.[214] The 2017 Draft Regulations contained provisions for environmental damage and basic financial mechanisms.[215] In 2018, the *Draft Exploitation Regulations* were updated, weakening specific provisions while strengthening others.[216] For example, there were comprehensive provisions for an environmental protection compensation

[206] *Ibid* at 2.
[207] *Ibid*.
[208] *Ibid*.
[209] *Ibid*.
[210] *Ibid* at 3.
[211] *Ibid;* see Chapter 5, *infra*, for additional details on financial aspects of the Mining Code.
[212] *Ibid* at 5.
[213] *Working Draft Regulations and Standard Contract Terms on Exploitation for Mineral Resources in the Area*, by ISA (Kingston, Jamaica: ISA, 2016).
[214] *Draft Regulations on Exploitation of Mineral Resources in the Area (2017)*, ISBA/23/LTC/CRP3 2017.
[215] *Draft Regulations on Exploitation of Mineral Resources in the Area (2018)*, ISBA/24/LTC/WP1/Rev1 2018.
[216] *Ibid*.

fund in the 2017 version, which disappeared in the 2018 version and reappeared as a watered-down provision in the updated 2019 regulations. The Mining Code's most recent draft is the March 2019 update and comprises thirteen parts and one-hundred and seven (107) regulations:

> Part 1 comprises the introductory terms,
> Part II contains regulations for the applications of approvals of plans of work,
> Part III is the rights and obligations of contractors, which includes their financial obligations,
> Part IV contains the obligations to protect the marine environment,
> Part V reviews plans of work and any modifications by contractors,
> Part VI includes the provisions for closure plans,
> Part VII details the financial terms of the exploitation contract, which includes royalty payments,
> Part VIII contains the applicable fees,
> Part IX is the information gathering provisions, including the confidentiality provisions and the creation of the seabed mining register,
> Part X has the general procedures, standards and guidelines,
> Part XI contains the compliance and inspection provisions,
> Part XII is the dispute settlement section.[217]

Additionally, there are ten (10) annexes and four appendices. The annexes contain administrative information on applications for plans of work, mining workplans, financing plans, the environmental impact statement, health and safety plans, and closure plans.[218] The appendices contain information on notifiable events and monetary penalties.[219] The ISA's *Draft Standards and Guidelines* supplement the regulations and create further rules and procedures, particularly for protecting and preserving the marine environment.[220]

To give effect to UNCLOS Article 150, Regulation 2(b) of the *Draft Exploitation Regulations* states that the fundamental principles are to ensure activities in the Area shall be carried out in such a manner as to foster the healthy development of the world economy and the balanced growth of international trade, and to promote international cooperation for the overall development of all countries, especially developing States.[221] The goal was to ensure that the

[217] *Draft Exploitation Regulations*, *supra* note 168.
[218] *Ibid.*
[219] *Ibid.*
[220] *Ibid* at Regulation 1(5).
[221] *Ibid* at Regulation 2(b).

area was developed, with a goal to increase the availability of the minerals derived from the Area as needed in conjunction with minerals derived from other sources to ensure supplies to consumers of such minerals.[222] In addition, the *Draft Exploitation Regulations* declare that the ISA's liability must consider contributory acts or omissions by the contractor, its employees, agents, subcontractors, and all persons working or acting for them.[223] Other goals include the:

- Orderly, safe and rational management of the Resources of the Area, including the efficient conduct of activities in the Area and, in accordance with sound principles of conservation,
- expansion of opportunities for participation in such activities,
- promotion of just and stable prices remunerative to producers and fair to consumers for minerals derived both from the Area and from other sources, and the promotion of long-term equilibrium between supply and demand,
- enhancement of opportunities for all States Parties, irrespective of their social and economic systems or geographical location, to participate in the development of the resources of the Area and the prevention of monopolization of activities in the Area,
- protection of developing countries from serious adverse effects on their economies or on their export earnings resulting from a reduction in the price of an affected Mineral or in the volume of exports of that mineral, to the extent that such reduction is caused by activities in the Area,
- access to markets for the imports of minerals produced from the resources of the Area and for imports of commodities produced from such minerals shall not be more favourable than the most favourable applied to imports from other sources, and
- exploitation in accordance with sound commercial principles and with good industry practice.[224]

Seabed mining terms and conditions should be similar to those of terrestrial mining. *Draft Exploitation Regulation* 2 states that the fundamental policies and principles of these regulations are to provide for the effective protection of the Marine Environment from the harmful effects which may arise from Exploitation, following the ISA's environmental policy, regional environmental management plans based on the following principles:

> (i) effective protection of the Marine Environment, including biological diversity and ecological integrity,
> (ii) the precautionary approach, as reflected in principle 15 of the Rio Declaration on Environment and Development,
> (iii) application of an ecosystem approach,
> (iv) application of "the polluter pays" principle through market-based instruments, mechanisms and other relevant measures, and
> (v) access to data and information relating to the protection and preservation of the Marine Environment.[225]

[222] *Ibid* at Regulation 2(b) (i) and (v).
[223] *Ibid* at Regulation 7.3.
[224] *Ibid* at Regulation 2.(b) and (c).
[225] *Ibid* at Regulation 2(5).

It is beyond the scope to detail all the provisions of *the Draft Exploitation Regulations*. As detailed later, environmental protections are challenged by other regulations.

The Mining Code's rules oblige a contractor and a Sponsoring State to create an environmental plan and impact assessment.[226] Environmental Impact Assessments ("EIAs") allow a State to present itself to domestic and transnational audiences as capable entities and help assert the government's sovereign authority over public policy decisions concerning mining activity and the environment.[227] Rules for EIAs are contained in section 7 of the *Draft Exploitation Regulations*, stating that an application for approval of a plan of work shall be accompanied by an assessment of the potential environmental impacts of the proposed activities and a description of a programme for oceanographic and baseline environmental studies.[228] Additional provisions of the Mining Code are discussed in detail in later chapters of the dissertation.

2.6.3 Standards and Guidelines

While *UNCLOS, the 1994 Agreement, and the Mining Code* contain environmental and social protection provisions, the *Standards and Guidelines* should contain detailed contractor obligations.[229] The *Draft Exploitation Regulations* explicitly note the need for *Standards and Guidelines*, especially for protecting and preserving the marine environment.[230] Guidelines guide technical and administrative matters issued by the ISA and must be updated and reviewed periodically based on improved knowledge or information.[231] Standards are technical standards

[226] *Ibid* at Part IV, Regulation 2.
[227] David Szablowski, *Transnational Law and Local Struggles: Mining, Communities, and the World Bank* (Oxford, 2007).
[228] *1994 Agreement supra* note 141.
[229] *UNCLOS*, *supra* note 104 at Articles 162, 165.
[230] *Draft Exploitation Regulations*, *supra* note 168 at Regulations 65, 95.
[231] *Ibid.*

and protocols, including performance and process requirements, qualitative and quantitative standards, methods, processes or required implementation technologies.[232] Standards are legally binding for contractors and the ISA and may be revised at least every five years from their adoption or revision date.[233] Guidelines will not be binding but have an impact based on the policy goals they assert.

During the 25th Session of the ISA, held between 25 February and 1 March 2019, the ISA began to undertake work on *Standards and Guidelines* for exploiting mineral resources in the Area as a priority.[234] A three-phase approach was recommended. Phase 1 created *Standards and Guidelines* deemed necessary to be in place by the time the draft regulations on exploitation were adopted. Phase 2 will create *Standards and Guidelines* prior to the receipt of an application of a plan of work for exploitation. Phase 3 *Standards and Guidelines* will be completed before commercial mining activities commence.[235] There are currently ten (10) *Standards and Guidelines for exploitation*.[236]

Financial requirements work in conjunction with environmental requirements. Parties shall cooperate to identify and develop best practices and improve existing standards, protocols and market-based instruments to support and enhance environmental performance.[237] Environmental standards must include environmental quality objectives, biodiversity status, plume density and extent, sedimentation rates, monitoring procedures, and mitigation

[232] *Ibid* at Regulation 94.
[233] *Ibid* at Regulation 95(3).
[234] ISA, *Report of the Chair of the Legal and Technical Commission on the work of the Commission at the second part of its twenty-fifth session* ISBA/25/C/19/Add.1 (11 July 2019) at Annex and Enclosures I and II.
[235] ISA, "The Mining Code: Standards and Guidelines" online: https://www.isa.org.jm/mining-code/standards-and-guidelines.
[236] Standards and Guidelines are based on the versions provided by the ISA during the 27th Session from 4-15 July 2022; ISA, "Standards and Guidelines" online: https://www.isa.org.jm/mining-code/standards-and-guidelines.
[237] *Draft Exploitation Regulations*, *supra* note 168 at Regulation 3.

measures.[238] Standards shall consider the views of experts, stakeholders and existing internationally accepted standards, including standards relating to the conservation of marine resources, protection of the marine environment, and environmental effects of exploitation activities, which still indicates significant leeway in how the ISA proceeds.[239] The *Draft Standards and Guidelines* are further considered in later chapters.[240]

2.6.4 The Common Heritage of Mankind

Seabed mining activities must be carried out for the benefit of mankind, considering the interests of developing States.[241] The aim is to allow developing States access to mining, which is currently the exclusive domain of large States and transnational corporations.[242] The discussion of the Common Heritage of Mankind is generally acknowledged as having its genesis in a speech by Ambassador Arvid Pardo in 1967.[243] It is argued that the Common Heritage of Mankind is an ethical ideal that could shape a new world order based on new forms of cooperation, economic theory and philosophy.[244] Explicitly contained within the concept is the need for developing States to participate in exploring and exploiting deep seabed minerals.[245]

By 2018, there was no consensus on applying the Common Heritage of Mankind, and as a result, Pew Charitable Trusts, a non-governmental organization, hosted a workshop on the common heritage.[246] The workshop's keynote speaker, Dr. Dire Tladi, outlined five essential elements of common heritage identified through the academic literature, other international

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[238] *Ibid* at Regulation 45.
[239] *Ibid* at Regulation 94.
[240] Keith MacMaster, "Sustainable Development and Seabed Mining: the Phase 1 Standards and Guidelines" [2023] Australian Yearbook of International Law [forthcoming].
[241] *UNCLOS*, *supra* note 104 at Article 136; Jaeckel, Gjerde & Ardron, *supra* note 165.
[242] Payoyo, *supra* note 54; Bourrel, Thiele & Currie, *supra* note 50; Jaeckel, Ardron & Gjerde, *supra* note 165.
[243] Pardo, *supra* note 47.
[244] Mann Borgese, *supra* note 48.
[245] Bourrel, Thiele & Currie, *supra* note 50; LFE Goldie, "A note on some diverse meanings of 'the common heritage of mankind" (1983) 10:1 Syracuse Journal of International Law and Commerce 69, 70, 71, 79.
[246] The Pew Charitable Trusts and RESOLVE, Inc, www.resolve.ngo (Ocho Rios, Jamaica, 2018).

treaty regimes, and the text in the UNCLOS.[247] These elements include the non-appropriation of resources, common management, benefit-sharing, peaceful use, and preservation of resources and benefits for future generations.[248] Benefit-sharing implies that people(s) most disadvantaged and marginalized should be allowed to develop seabed mining, and other nations could provide opportunities and financial benefits.[249] The Common Heritage of Mankind should also achieve intergenerational and intragenerational equity, two concepts detailed later in this thesis.[250]

Canada's delegation to the workshop noted that common heritage "is resonant with the idea of stewardship as invoked by environmentalists in the hope that common heritage is operationalized to include environmental protection."[251] The Canadian representative offered (as a reference example) the Norwegian sovereign wealth fund, in which profits from oil and gas operations have provided a large and growing capital to spend the income for social benefits.[252] The conference attendees agreed that an established definition of common heritage needs to be established, which could help establish environmental objectives and identify the additional research needed to meet those objectives.[253] There was no agreement on the appropriate share of the seabed to be held for future generations.[254]

The Common Heritage of Mankind is vital to seabed mining finance. Achieving equitable sharing arises if seabed mineral resources are utilized while balancing all interests and

[247] Bourrel, Thiele & Currie, *supra* note 15; Jaeckel, Ardron & Gjerde, *supra* note 294; Tullio Scovazzi, "The concept of common heritage of mankind and the genetic resources of the seabed beyond the limits of national jurisdiction" (2007) 14:25 Agenda internacional (Lima, Peru) 11–24.
[248] *2018 - Common Heritage of Mankind: Definition & Implementation - Final Report v2*, by The Pew Charitable Trusts and RESOLVE, Inc, www.resolve.ngo (Ocho Rios, Jamaica, 2018); *UNCLOS*, *supra* note 104 at Articles 137, 139. 141, 192, 235.
[249] RESOLVE, Inc., *supra* note 246 at 3.
[250] *Ibid*.
[251] *Ibid* at 5.
[252] *Ibid*.
[253] *Ibid*.
[254] *Ibid* at 10, 12.

considerations at stake.[255] There is a sense of urgency to begin exploitation and a reluctance by regulators to slow down exploitation. Benefits mankind can derive from the Area include wealth generation and redistribution, advancement of developing States, and security of mineral supply.[256] Ambiguities in definitions provide uncertainty when creating a fiscal framework. If the ISA follows terrestrial financial arrangements for mining, these issues may continue with seabed mining. One potential contractor notes:

> The Common Heritage concept also includes the idea that our global commons should be preserved for the benefit of future generations. The good news is metals contained in common heritage rocks are recyclable and could be used indefinitely by future generations. But to realize this future, we need to change how we view metals: we should stop treating them as consumables that we use and throw away at the end of product life and start treating them as a common heritage stock that can be rented and recycled.[257]

This would require a comprehensive cost-benefit analysis of seabed mining that integrates externalities and fully considers the value of the natural capital and other uses.[258] This includes establishing an equitable benefit assessment and benefit-sharing regime before licensing exploitation.[259] Seabed mining's potential profitability depends on the world market for the relevant minerals and the non-existence of artificial controls on those markets.[260] A comprehensive financial analysis of seabed mining, incorporating environmental considerations, has not yet been attempted. As of 14 May 2023, the *Draft Exploitation Regulations* are not yet finalized. Comments on improving the *Draft Exploitation Regulations* include the need for a greater emphasis on effective marine environment protection and better governance of the

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[255] Bourrel, Thiele & Currie, *supra* note 50 at 313.
[256] Aline Jaeckel, "Benefitting from the Common Heritage of Humankind: From Expectation to Reality" (2020) 35:4 International Journal of Marine and Coastal Law 1.
[257] TMC, *The Metals Company Publishes Inaugural Impact Report Detailing Future Operations and Strategy for Net-Positive Planetary Impact* (2022).
[258] Institute for Advanced Sustainability Studies, *International Seabed – the Common Heritage of Mankind* (IASS Policy Brief 2/2018) online: https://www.umweltbundesamt.de/sites/default/files/medien/2875/dokumente/chm_policy_brief.pdf; Sabine Christiansen et al., *Towards a Contemporary Vision for the Global Seafloor Implementing the Common Heritage of Mankind,* Heinrich Böll Foundation ed. (Institute for Advanced Sustainability Studies and TMG, 2019).
[259] IASS, *supra* note 258 at 9.
[260] Hegwood, *supra* note 74 at 176.

ISA.[261] Additional suggestions include explicitly adopting sustainable and socially responsible policies and defining certain terms, including rehabilitation, environmental impact, effective control, and damage to the marine environment.[262] As shown in Chapter 7, a sustainable seabed mining valuation code would assist with these gaps and suggestions.

[261] *Draft regulations on exploitation of mineral resources in the Area Collation of specific drafting suggestions by members of the Council,* 26th *Sess. P*art I, Kingston (17-21 February 2020) ISBA/26/C/CRP.1.
[262] *Ibid* at 10, 137-139-140.

Chapter 3 - Parties to Seabed Mining

Chapter 3 identifies the parties involved in seabed mining. Potential claimants and interested parties have a significant impact as stakeholders in preventing and mitigating social and environmental harm. Private (non-government owned) contractors, subcontractors, State owned contractors, and potentially the Enterprise will be the main operators in seabed mining.[1] A Sponsoring State oversees the firms' activities conducting mining operations.[2] Ships and other processing and support vessels have a Flag State where they are registered. The processing plant may be in a country unconnected to the Flag or Sponsoring State.[3] Sponsoring States, contractors, their liabilities and effective control are analyzed. Insufficient capitalization of subsidiary companies of Sponsoring States that do not effectively control their sponsored entities may prevent the restoration and remediation of the seafloor environment.[4] A gap analysis on the legal liability of potential seabed mining parties will help develop a seabed valuation code that addresses and fills these gaps and applies to all parties involved in seabed mining operations.

3.0 The Enterprise

The Enterprise will be the ISA's operating arm and exploit, transport, process, and market any minerals recovered from its operations.[5] The Enterprise is intended to assist in facilitating the

[1] Tara Davenport, *Possible Forums for Liability Claims Arising from Deep Seabed Mining: Problems & Prospects* (Kingston, Jamaica, 2019).
[2] Keith MacMaster, Environmental Liability for Deep Seabed Mining in the Area: an Urgent Case for a Robust Strict Liability Regime 33:1 (2019) Ocean Yearbook Online 339 at 344, 348, 353.
[3] Third parties, including financial institutions and insurance companies, have a material interest through financing and contractual obligations to these parties.
[4] Joanna Dingwall, *International Law and Corporate Actors in Deep Seabed Mining* (Oxford University Press, 2021); Joanna Dingwall, "Commercial Mining Activities in the Deep Seabed beyond National Jurisdiction: the International Legal Framework" in Catherine Banet, ed, *The Law of the Seabed* (Leiden/Boston: Brill, 2020).
[5] Nataša Nedeski & André Nollkaemper, "Responsibility of International Organizations 'in connection with acts of States'" (2012) 9:1 International Organizations Law Review 33–52 at 40; *Draft articles on the responsibility of international organizations, UN GAOR, 63rd Sess., U.N. Doc. A/66/10, (2001)* at Article 6; James Crawford, *State responsibility: the General Part* (New York: Cambridge University Press, 2013) at 203, 204.

participation of developing States in seabed mining. It can carry out such mining activities in reserved areas in association with developing States.[6]

By Resolution 2467A(XXVIII) of 21 December 1968, the United Nations General Assembly established the Seabed Committee and requested the Secretary-General to undertake a study on establishing "appropriate international machinery" to promote the exploration and exploitation of seabed resources.[7] The Enterprise was conceived a year later, under the 1969 *Committee on the Peaceful Uses of the Seabed and the Ocean Floor Beyond the Limits of National Jurisdiction*. It was envisioned as the sole operator for seabed mining in the Area.[8] By 1971, many developed States disagreed with the Enterprise's direction, wanting a parallel system, with the Enterprise working with other operators through a licensing system. Many developing States feared that the Enterprise would be run by experts from developed countries and have a monopoly on exploitation. They argued that a licensing system would be incompatible with the notion of the Common Heritage of Mankind since it would leave the sea to the mercy of companies whose methods were only too well known.[9] Developing States were not unified. Nigeria called for a rethink of the two extreme positions, and Madagascar and Ghana wanted robust machinery similar to the licensing option. Congo called for an intermediate stage of cooperation between public and private capital in the form of mixed economy companies.[10]

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[6] Edwin Egede, Mati Pal & Eden Charles, *A Study on Issues Related to the Operationalization of the Enterprise in particular on the Legal, Technical and Financial Implications for the International Seabed Authority and for States Parties to the United Nations Convention on the Law of the Sea* (2019) at 11, 18.
[7] *Examination of the question of the reservation exclusively for peaceful purposes of the sea-bed and the ocean floor, and the subsoil thereof, underlying the high seas beyond the limits of present national jurisdiction, and the use of their resources in the interests of mankind*, UNGA Res. 2467 (XXIII) (1968); G W Haight, "Developments in the United Nations Relating to Sea-Bed and Ocean Floor" (1969) 2:2 Natural Resources Lawyer 119–130.
[8] UN, "A/RES/25/2749 - Declaration of Principles Governing the Sea-Bed and the Ocean Floor, and the Subsoil Thereof, beyond the Limits of National Jurisdiction" online: http://www.un-documents.net/a25r2749.htm.
[9] ISA, *Legislative history of the "Enterprise" under the United Nations Convention on the Law of the Sea and the Agreement Relating to the Implementation of Part XI of the Convention* 976-610-468-9 (Jamaica, 2002) at representative from Cuba 42.
[10] *Ibid* at 49.

During UNCLOS III, four options were suggested, which resulted in the *1974 (Draft) Convention on the Seabed and the Ocean Floor Beyond the Limits of National Jurisdiction*.[11] These four alternatives were operations conducted by a contracting party or group of Contracting Parties, natural or juridical persons under the authority or sponsorship of a State, directly by the ISA, or a regulated ISA granting contracts to contractors.[12] There was no specific mention of State or State Enterprises at this time.[13]

By 1976, the intention was to have activities conducted by the Enterprise as the sole operator.[14] The Enterprise shall offer its products for sale at not less than international market prices, although it may sell its products at lower prices to developing countries, particularly the least developed among them.[15] Capitalization requirements of the Enterprise began to be formed, while liability issues focused on making the assets immune from seizure, attachment, or execution.[16] The *1977 Informal Negotiating Text* still envisioned the Enterprise as the sole operator.[17] The drafters of the text would have provided the Enterprise with the funds required to carry out its functions while having assets immune to judgment and seizure.[18] New provisions

[11] *Official Records of the Third United Nations Conference on the Law of the Sea*, Vol. III (UN Pub No. E.75.V.5), Documents of the Conference, First Session: New York, 3-15 December 1973; Second Session: Caracas, 20 June-29 August 1974, at 157-164.
[12] *1974 (Draft) Convention on the Seabed and the Ocean Floor Beyond the Limits of National Jurisdiction* U.N. Doc. A/CONF.62/23 at *Article 9.*
[13] *Official Records of the Third United Nations Conference on the Law of the Sea*, Vol. IV, (UN Pub No. E.75.V.10) 19th meeting of the First Committee, 26 March 1975, Third Session of UNCLOS III (Geneva, 17 March-9 May 1975) A/CONF.62/WP.822 at 137; Informal Single Negotiating Text (7 May 1975) at 16.
[14] *Legislative history of the Enterprise, supra note 9* at 89.
[15] UNCLOS III, *Revised Single Negotiating Text* A/CONF.62/WP.8/Rev.1/Part 1 (6 May 1976) at s. 7.
[16] *Ibid* at ss. 3 & 4; *Official Records of the Third United Nations Conference on the Law of the Sea*, Vol. V, (UN Pub No. E.76.V.8), Summary Records of Meetings, 57th meeting of Plenary, 15 March 1976; UNCLOS III, *Fourth Session of UNCLOS III* (New York, 15 March-7 May 1975) at 4, para 17; UNCLOS III, *Note by the President* A/CONF.62/WP.8/Rev. *at* 125.
[17] 1976 *Revised Single Negotiating Text*, A/CONF.62/WP.8/Rev.1 at Article 169(1).
[18] *Ibid* at Article 169(4), Annex III, ss 2, 9; *Official Records of the Third United Nations Conference on the Law of the Sea*, Vol. VIII, (UN E.78.V4), Sixth Session of UNCLOS III (New York, 23 May-15 July 1977), Document A/CONF.62/ WP.10/Add.1, *Memorandum by the President of the Conference* UN Doc. A/CONF.62/WP.10 at 65.

kept immunity but began to give the Enterprise terms no less favourable than those afforded to states for similarly engaged commercial entities.[19]

By 1978, tensions had escalated regarding the nature and function of the Enterprise.[20] The Enterprise would carry out activities by states, state entities, or persons natural or juridical which possess the nationality of States or are effectively controlled by them.[21] The Eighth Session and resumed Eighth Session of UNCLOS III, held in 1979, added additional financial and technical requirements for the Enterprise and provisions to strengthen joint ventures.[22] The 1979 *Draft Negotiating Text* states that the Enterprise shall be the organ of the ISA, with mandatory technology transfer and State funding provisions included.[23] The 1979 revisions made the Enterprise equal to a contractor, with fair and reasonable commercial terms being made available.[24]

The Ninth Session of UNCLOS III, *Draft Convention on the Law of the Sea (informal text)* of 27 August 1980, provided for a parallel system.[25] The amendments on technology transfer were aimed at making undertakings between the Enterprise and the technology owner binding while at the same time establishing limitations on the duration and type of technology to

[19] UNCLOS III*, Informal Composite Negotiating Text Rev. 1*, A/CONF.62/WP.10/Rev.1 (NY, 23 May to 15 July 1977).
[20] Danny M Leipziger, "Mining the Deep Seabed" (1977) 20:1 Challenge (White Plains) 52–55 at 54.
[21] *Official Records of the Third United Nations Conference on the Law of the Sea,* Vol. X, (UN Pub No. E.79.V.4), Reports of the Committees and Negotiating Groups, Seventh Session: Geneva, 19 May 1978, Resumed Seventh Session: New York, 21 August-15 September 1978, Document A/CONF.62/62, *Organization of work: Decisions taken by the Conference at its 90th meeting* (13 April 1978) at 6, Article 151(2).
[22] UNCLOS III, *Eighth and Resumed Eighth Session*, Geneva, 19 March to 27 April 1979 and New York, 19 July to 24 August 1979) *Negotiating Texts* at Annex Articles 10, 11.
[23] *Ibid* at Article 170.
[24] *Ibid* at Annex II, Article 12(1); *Official Records of the Third United Nations Conference on the Law of the Sea,* Vol. XI, (UN No. E.80. V.6), Summary Records of meetings, Eighth Session: Geneva, 19 March-27 April 1979, Document A/CONF.62/L.36, *Report of the Chairman of the First Committee,* 26 April 1979, at 96.
[25] *Draft Convention on the Law of the Sea (informal text*) A/CONF.62/WP.10/Rev.3/Corr.1 (Geneva: UN) (29 Aug. 1980) from *Official Records of the Third United Nations Conference on the Law of the Sea,* Vol. XIII, (United Nations Publication, Sales No. E.80. V.7), Summary Records of meetings, Ninth Session: New York, 3 March to 4 April and 28 July to 29 August 1980, Document A/CONF.62/BUR/SR.53.

be transferred.[26] The Enterprise would be granted mining access and joint venture agreements alongside private or State companies.[27] The operator had to make technology available to the Enterprise to the extent made available to itself and on reasonable commercial terms.[28]

During UNCLOS III, it was assumed that all State Parties would guarantee debts incurred by the Enterprise.[29] The amount of the funds would enable the Enterprise to process up to four metals: cobalt, copper, manganese, and nickel.[30] Fifty percent (50%) of the funds would be long-term interest-free loans from State Parties, while the Enterprise would raise the remaining fifty (50%) percent through interest-bearing loans guaranteed by States.[31] Many nations were against this proposal, claiming that the Enterprise would be a new institution with no assets and no track record, and they were concerned that they would be paying all the monies to pay for the Enterprise yet have no say in its affairs.[32] Developed nations wanted entities operating on the two sides of the parallel system to be treated equally and make equal payments as other contractors.[33] They argued that State corporations and public enterprises of a commercial nature were taxed in most countries. The draft text stated that the Enterprise, its assets, property, and revenues shall be immune from national taxation. Developed countries complained that this

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[26] *Ibid* at Annex II, Article 5.
[27] Günther Jaenicke, *A joint venture agreement for seabed mining* (Deventer, The Netherlands: Kluwer, 1981) at 5.
[28] Legislative history of the Enterprise , *supra* note 9.
[29] *Official Records of the Third United Nations Conference on the Law of the Sea,* Vol. X, (UN Sales No. E.79.V.4), *Reports of the Committees and Negotiating Groups*, Seventh Session: Geneva, 21 March-19 May 1978, Resumed Seventh Session: New York, 15 September 1978, Document A/CONF.62/62, Organization of work: Decisions taken by the Conference at its 90th meeting on the report of the General Committee, (13 April 1978) at 6; *Official Records of the Third United Nations Conference on the Law of the Sea,* Vol. XI, (United Nations Publication, Sales No. E.80. V.6); *Summary Records of meetings*, Eighth Session: Geneva, 19 March-27 April 1979, Document A/CONF.62/L.36, Report of the Chairman of the First Committee (26 April 1979) at 96; UNCLOS III, *Informal composite negotiating text/revision 2*, UN Doc. A/CONF.62/WP.10/Rev.2, 11 April 1980 Article 3(a).
[30] The four metals are mentioned not to compel the Enterprise to process the four metals even if it is uneconomic to do so but to establish a criterion for computing the amount of the funds given to the Enterprise.
[31] *1980 Draft Convention on the Law of the Sea (informal text), supra* note 29.
[32] *Official Records of the Third United Nations Conference on the Law of the Sea*, Vol. XIII, (UN Pub. No. V.5), Summary Records of meetings, Ninth Session: New York, 3 March-4 April 1980, *Document of the First Committee,* Documents A/CONF.62/C.1/L.27 and Add.1*, Report of the coordinators of the Working Group of 21* at 113-137.
[33] *Ibid* at 131, *Report of the coordinators of the Working Group of 21* at 50.

paragraph infringed upon their national sovereignty. [34] The United States representative argued that further work was needed to place a more effective limitation on the potential liability of States Parties for contributions to the capital of the Enterprise.[35] The representative of Canada said that the Enterprise should not be provided with any financing beyond the first generation of projects.[36] Poland's representative said the scale of contributions should be proportionate to the benefits which States would derive from exploitation.[37] The representatives of Italy and Spain said privileges and immunities should be re-examined to ensure that the Enterprise would be placed on the same footing as States corporations.[38] Members of the Group of 77 developing nations were concerned about any compromise proposal. In many developing and some developed countries, such industries are granted exemption from taxation for a limited period.[39] Since the Enterprise would have to buy its equipment and machinery from industrialized countries, it would have a weighty financial burden if not tax-exempt.[40] These objections led to further revisions with a new *negotiating text*, which included a provision that every operator must make available to the Enterprise if on fair and reasonable commercial terms and conditions.[41] The text granted the Enterprise the right to the opportunity to decide whether it intends to carry out activities in each reserved site in joint ventures and exempted the Enterprise from making payments for ten years.[42] The Enterprise shall offer developing States the

[34] *Ibid*.
[35] *Ibid*.
[36] *Ibid*.
[37] *Ibid*.
[38] *Ibid.*
[39] *Informal composite negotiating text/revision 2*, UN Doc. A/CONF.62/WP.10/Rev.2, 11 April 1980. A tax holiday of 10 years was put forth as adequate to enable the Enterprise.
[40] *Official Records of the Third United Nations Conference on the Law of the Sea, supra* note 29 at 71.
[41] *Informal composite negotiating text/revision, 2 supra* note 39 at Articles 3, 9, 11.
[42] *Ibid* at Article 9(1) and Annex IV.

opportunity for effective participation.[43] Contractors entering joint arrangements may receive financial incentives.[44]

China noted that the new text did not provide financial resources to compensate for shortfalls in financial contributions.[45] The United States representative remained committed to the deletion of technology transfer.[46] Australia's representative said that States Parties needed to know the maximum amount of their contributions and that a shortfall provision was needed.[47] The representatives of Poland and Japan said that, while accepting the necessity of providing the Enterprise with the necessary funds and technology, the financial burden placed on States should be proportionate to the benefits they would derive from exploiting the Area's resources.[48]

The Group of 77 had concluded that the funds for the Enterprise's first mining site had not been guaranteed and that the Enterprise must be exempted from paying tax. Ecuador's representative said the transfer of technology was necessary, as were provisions for financial resources that they needed to operate for the benefit of mankind and compete on an equal footing with other enterprises.[49] The Libyan representative said that the provision must be understood to cover processing technology and that industrialized countries should contribute a larger financial share.[50] The representative of Tonga said that small countries would find it burdensome to contribute.[51]

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[43] *Ibid* at Article 9(2).
[44] *Ibid* at Article 11(2).
[45] *Report of the President on the work of the informal plenary meeting of the Conference on the question of the preparatory commission*, A/CONF.62/L.55; Negotiating Text, A/CONF.62/62.99 at Annex IV, Article 11(3)(a).
[46] Egede, Pal & Charles, *supra* note 6; Legislative history of the "Enterprise, *supra* note 9.
[47] *Ibid.*
[48] *Ibid.*
[49] Jon Dyke & David L. Teichmann, "Transfer of seabed mining technology: A stumbling block to U.S. ratification of the law of the sea convention?" (1984) 13 Ocean Development and International Law 427-455.
[50] *Official Records of the Third United Nations Conference on the Law of the Sea*, Vol. XIV (UN Pub No. E.82.V.2), Summary Records of meetings, resumed Ninth Session: Geneva, 29 August 1980, Documents of the First Committee A/CONF. 62/C.1/L. 28 and Add.1, *Report of the coordinators of Working Group of 21 to the First Committee* (23 August 1980) at 161-184.
[51] *Ibid* at 170.

A group of developed nations drafted separate recommended provisions, including sponsorship provisions where the applicant has more than one nationality, a due diligence obligation by a Sponsoring State, more stringent financial and technical capabilities, and a character test for assessing the qualifications of State Parties.[52] Further, they recommended changes to technology transfer on fair and reasonable commercial terms and on operations to be on sound commercial terms while shortening the immunity of the Enterprise.[53] It strengthened joint ventures and liability on financial incentives.[54] When additional changes were made in 1980, this recommended text was removed from consideration.

During the 1980s, estimates of the non-recurring costs of the Enterprise ranged from $31 million to almost $70 million, while estimates for the recurring costs ranged from $5.1 million to $7.9 million.[55] As such, during the first part of the Tenth Session, further revisions occurred, making the Enterprise an ISA organ, which shall carry out activities in the Area directly and transport, process, and market the minerals recovered from the Area.[56] It was to be provided with funds as it may require carrying out its functions.[57] Technology transfer was mandatory but was now to be provided on fair and reasonable commercial terms.[58] The Enterprise would not

[52] *Modifications to the negotiation text proposed by the Working Group of 21*, A/CONF.62/C.1/L.28 and Add.1 at Annex*,* Annex III, Article 4.
[53] *Ibid* at Annex III, Article 5, Annex IV, Article 1, Annex IV, Article 13.
[54] *Ibid* at Article 11.
[55] Legislative history of the Enterprise, *supra* note 9 at 272, as taken from A/CONF.62/L.78 (the "L.78" revisions).
[56] *Draft Convention on the Law of the Sea*, UN Doc A/CONF.62/L.78; *Official Records of the Third United Nations Conference on the Law of the Sea,* Vol. XV, (UN Pub No. E.83. V.4), Summary Records of meetings, Tenth Session and resumed Tenth Session: New York, 9 March-16 April 1981; Geneva, 3-28 August 1981, Document A/CONF.62/ L.65, (18 February 1981) at pp. 102-118.
[57] *Ibid* at Article 170, Annex IV, Article 1.
[58] *Ibid* at Annex III, Article 5; Dyke & Teichmann *supra* note 49 at 433; *Changes suggested by the heads of delegations of Australia, Canada, Denmark and Norway on behalf of a group of ten heads of delegations* UN Doc. A/CONF.62/L.104 and Add.1, WG.21 / Informal Paper 21 (10 March 1982); Australia, Austria, Canada, Denmark, Finland, Iceland, Ireland, New Zealand, Norway, Sweden and Switzerland: amendments UN Doc. A/CONF.62/L.121; Belgium, France, Germany, Federal Republic of, Italy, Japan, United Kingdom of Great Britain and Northern Ireland and United States of America: amendments UN Doc. A/CONF.62/L.122.

need to submit payments for ten years and would be allowed to negotiate tax-exempt status with host countries, allowing the Enterprise's creditors to have some say in using their assets. [59]

UNCLOS, Article 153 thus envisaged that the Enterprise, State Parties, State Enterprises, and natural and juridical persons would carry out activities in the Area.[60] UNCLOS makes the Enterprise an autonomous institution, yet an organ of the ISA that shall carry out activities in the Area directly and the transporting, processing, and marketing minerals recovered from the Area.[61] The Enterprise's responsibility and liability are not made explicit in UNCLOS. Article 22 of Annex III (which sets out the contractors' respective liability and the ISA) does not refer to the Enterprise. However, nothing in UNCLOS shall make the Enterprise liable for the acts or obligations of the ISA or make the ISA liable for the Enterprise's acts or obligations.[62] This effectively creates a veil around the Enterprise, preventing attribution of responsibility to the ISA or a Member State, merely because of their membership, to be liable for the Enterprise's acts or obligations.[63] There were still objections to the Enterprise, especially on technology transfer and production limitations.[64]

By 1983, prospects for commercial mining seabed minerals had receded into the next century.[65] PrepCom's consultations identified issues representing areas of difficulty, including costs to State Parties, the Enterprise, decision-making of the authority, technology transfer,

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[59] *Ibid* at Annex IV, Article 10, 13.
[60] *United Nations Convention on the Law of the Sea 1833* UN Treaty Series 397, 1982 at Annex IV, Statute of the Enterprise.
[61] *Ibid* at Article 170, Annex IV; Egede, Pal & Charles, *supra* note 6 at 59.
[62] *Ibid* at Annex IV, Article 3.
[63] Egede, Pal & Charles, *supra* note 6 at 18.
[64] *Official Records of the Third United Nations Conference on the Law of the Sea,* Vol. XVI, (UN Pub. No. E.84.V.2), Summary Records of meetings and Documents, Eleventh Session: New York, 8 March-30 April 1982, 55th and 56th meetings of the First Committee, (9 and 29 March 1982) at 160-170.
[65] In the *Secretariat's Information Note*, it was noted that it was unlikely that the Enterprise would be able to undertake operational activities independently for quite some time. Due to this, and only if seabed mining becomes technologically and economically feasible, consideration would need to be given to the Enterprise's various organizational and operational options.

production limitation, compensation funds, financial terms of the contract, and environmental considerations.[66] PrepCom believed funding obligations for the Enterprise's first mining operation would not arise since the exploitation is carried out in the initial phase through joint ventures.[67]

The Enterprise regime and transfer of technology provisions under the convention were revised under the *1994 Agreement.*[68] The Enterprise is still seen to help facilitate the participation of developing States, as it can carry out such mining activities in the reserved areas in association with developing States.[69] States Parties are not obligated to finance any operations in any mine site of the Enterprise or under joint venture arrangements.[70] The equity interest scheme was introduced in response to the technical difficulties in dividing a working area into two with equivalent economic value.[71] Member States are not obliged to provide long-term interest-free loans.[72] Rather, the Enterprise and developing States wishing to obtain deep seabed mining technology shall seek to obtain such technology on fair and reasonable commercial terms and conditions on the open market or through joint-venture arrangements.[73] The Enterprise shall not be obligated to provide funds, issue guarantees, or accept any financial liability because of its equity participation, nor shall it be required to subscribe for additional equity participation to

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[66] *Ibid*. Environmental considerations were removed in 1992.
[67] UNGA, Official Record of the General Assembly, 22nd Sess, Annexes Agenda Item 92, UN Doc. A/6695; Rob Huebert, "Canada and the Law of the Sea Convention" (1997) 52:1 International Journal 69 at 77; *Consultations of the Secretary-General on outstanding issues relating to the deep seabed mining provisions of the United Nations Convention on the Law of the Sea*, Report of the Secretary-General, A/48/950 (9 June 1994).
[68] *Agreement relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982* 1836 UNTS 42 1994.
[69] Legislative history of the "Enterprise, *supra* note 9 at 11.
[70] Egede & Eden, *supra* note 6 at 18, Nedeski & Nollkaemper, *supra* note 5 at 40; Legislative History of the Enterprise, *supra* note 9 at representative from Cuba 42; Klaas Willaert, "The Enterprise: State of affairs, challenges and way forward" (2021) 131 Marine policy 104590.
[71] Agustina Merdekawati & I Made Andi Arsana, "Equity Interest Scheme in Polymetallic Nodules Deep Seabed Mining: The Positives and Negatives" 29:1 (2022) Jurnal Media Hukum online: https://journal.umy.ac.id/index.php/jmh/article/view/13770 at 35.
[72] *1994 Agreement, supra note 68*.
[73] *Ibid* at Annex, s. 5(1)(a).

maintain its proportionate participation.[74] If the Enterprise or developing States cannot obtain the seabed mining technology, the ISA may request contractors and their Sponsoring State(s) to cooperate with technology acquisition.[75]

The *1994 Agreement* removes any preferential treatment for the Enterprise by insisting that the obligations applicable to other contractors shall apply to the Enterprise, including applying a plan of work, which shall be in the form of a contract concluded between the ISA and the Enterprise.[76] With the Enterprise having the same status as a contractor, it would have responsibility or liability for damages arising from any wrongful acts in its operations.[77] If the proposed joint-venture operations with the Enterprise accord with sound commercial principles, the Council shall issue a directive providing for independent operation.[78] In 2012, Nautilus Minerals Inc. (now in bankruptcy and owned by TMC) presented a proposal to enter negotiations to form a joint venture with the Enterprise. Poland expressed interest in forming a joint venture with the Enterprise.[79]

The Enterprise could be comparable internationally to a state-owned mining corporation.[80] The Enterprise can submit a plan of work for exploration or exploitation activities in the Area. However, there are still many unknowns with the Enterprise. Although an operating Enterprise might become financially self-supporting or profitable, initial capital will be required. This capital might be supplied directly by participating States, in equal amounts or

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[74] *Decision of the Assembly of the International Seabed Authority relating to the Regulations on Prospecting and Exploration for Cobalt-rich Ferromanganese Crusts in the Area*, ISBA/18/A/11 at Regulation 19(2).
[75] *1994 Agreement supra* note 68 at Annex, s. 5(1)(b).
[76] Egede, Pal & Charles, *supra* note 6 at 16.
[77] *Ibid* at 18.
[78] *UNCLOS*, *supra* note 60 at Annex IV, s. 2.
[79] *Considerations relating to a proposal by Nautilus Minerals Inc. for a joint venture operation with the Enterprise:* Report by the Secretary-General, ISBA/19/C/6 (4 April 2013) at paras. 12-19; *Considerations relating to a proposal by the Government of Poland for a possible joint venture operation with the Enterprise*: Report of the Secretary-General, ISBA/24/C/12 (25 May 2018).
[80] Egede, Pal & Charles, *supra* note 6 at 8.

according to some agreed criteria, and raised from international financial institutions or private sources. The ultimate question (which cannot be resolved in this dissertation) will be whether the Enterprise will be an operational entity or whether it will simply be a shell company that receives revenue from an operating contractor.[81] Thus, capitalization and investment into the Enterprise may depend on the confidence in the ability of the Enterprise to value minerals.

3.1 Sponsoring States

The element of sponsorship is fundamental to the international seabed regime. Sponsorship should ensure that a State Party ultimately has international responsibility for the contractor's activities and requires the exercise of effective control.[82] UNCLOS Article 153(2) provides that the Enterprise shall carry out activities in the Area by States Parties, or State Enterprises or natural or juridical persons which possess the nationality of States Parties or are effectively controlled by them or their nationals when sponsored by such States.[83] To obtain a permit to explore the Area for seabed minerals, a Sponsoring State must submit a work plan and provide a certificate of sponsorship.[84] The same responsibility applies to international organizations for activities in the Area carried out by such organizations.[85] Damage caused by the failure of a State Party or international organization to carry out its responsibilities under this part shall entail liability. States Parties or international organizations acting together shall bear joint and several liability. A State Party shall not be liable for damage caused if the State Party has taken all

[81] *Ibid* at 11.
[82] Andrés Sebastián Rojas & Freedom-Kai Phillips, *Effective Control and Deep Seabed Mining: Toward a Definition* (Waterloo: CIGI, 2019).
[83] *UNCLOS*, *supra* note 60 at Articles 139, 153(2*); Draft Regulations on Exploitation of Mineral Resources in the Area* (2019), ISBA/25/C/WP1 2019 at Regulation 5.
[84] *Draft Exploitation Regulations*, *supra* note 83 at Regulation 6.
[85] *UNCLOS*, *supra* note 60 at Article 139.

necessary and appropriate measures to secure effective compliance.[86] Article 139 then creates and limits liability on the Sponsoring State:

> Without prejudice to the rules of international law and Annex III, article 22, damage caused by the failure of a State Party or international organization to carry out its responsibilities under this Part shall entail liability; States Parties or international organizations acting together shall bear joint and several liability. A State Party shall not however be liable for damage caused by any failure to comply with this Part by a person whom it has sponsored under Article 153, paragraph 2(b), if the State Party has taken all necessary and appropriate measures to secure effective compliance under article 153, paragraph 4, and Annex III, article 4, paragraph 4.[87]

A key phrase is all necessary and appropriate measures. Annex III(4)(4) modifies this language somewhat by stating that the Sponsoring State or States shall, pursuant to Article 139, have the responsibility to ensure, within their legal systems, that a contractor so sponsored shall carry out activities in the Area in conformity with the terms of its contract and its UNCLOS obligations. A Sponsoring State shall not, however, be liable for damage caused by any failure of a contractor sponsored by it to comply with its obligations if that State Party has adopted laws and regulations and taken administrative measures which are, within the framework of its legal system, reasonably appropriate for securing compliance by persons under its jurisdiction.[88] The *Exploration Regulations* also assert a reasonableness requirement:

> The Sponsoring State or States shall, pursuant to Article 139, have the responsibility to ensure, within their legal systems, that a contractor so sponsored shall carry out activities in the Area in conformity with the terms of its contract and its obligations under this Convention. A Sponsoring State shall not, however, be liable for damage caused by any failure of a contractor sponsored by it to comply with its obligations if that State Party has adopted laws and regulations and taken administrative measures which are, within the framework of its legal system, reasonably appropriate for securing compliance by persons under its jurisdiction.[89]

The *1994 Agreement* did not modify sponsorship or effective control requirements. A State sponsoring an application for a plan of work may be a State Party or a provisional State

[86] *Ibid*.
[87] *Ibid*.
[88] *Ibid* at Annex III(4)(4).
[89] *Decision of the Council of the International Seabed Authority relating to amendments to the Regulations on Prospecting and Exploration for Polymetallic Nodules in the Area and related matters*, ISBA/19/C/17 (2013) at Article 4(4).

Party.[90] An approved plan of work for exploration sponsored by at least one state provisionally applying this Agreement shall terminate if such a State ceases to apply the *1994 Agreement* or has not become a State Party.[91] The *1994 Agreement* further clarified that in the case of entities whose components are natural or juridical persons possessing the nationality of more than one State, a plan of work for exploration shall not be approved unless all the States whose natural or juridical persons comprise those entities are States Parties.[92]

The ISA granted thirty-one (31) contracts for exploration to 16 Sponsoring States as of the writing date (4 May 2023).[93] China sponsors five (5) contracts, with three (3) to South Korea and Russia.[94] Japan, France, India, the United Kingdom, and Germany have two (2) sponsorships, while Brazil, Poland, Nauru, Tonga, Jamaica, Belgium, Kiribati, Singapore, and the Cook Islands have one each.[95] Interoceanmetal Joint Organization ("IOM") is the only contractor sponsored by multiple states.[96] There are no licenses for exploitation granted to date.

What is meant by effective control? UNCLOS, the *1994 Agreement* and the *Exploration Regulations* do not provide an answer as the terms entity, State Actor, State Enterprise, non-state actor, and private corporation are amorphous.[97] The Sponsoring State has assumed effective control over the contractor; however, effective control issues remain.[98] Effective control is clear when the contractor and Sponsoring State are owned and controlled by the same entity. For

[90] *1994 Agreement, supra* note 68, Annex, 4(4).
[91] *Ibid* at Annex 11.
[92] *Ibid* at Section 12.
[93] Tara Davenport, *Responsibility and Liability for Damage Arising Out of Activities in the Area: Attribution of Liability*, CIGI Report 4 (CIGI, 2019).
[94] ISA, "Exploration Contracts" online: https://www.isa.org.jm/exploration-contracts (accessed 3 May 2022).
[95] *Ibid*.
[96] IOM, "Interoceanmetal Joint Organization", online: https://iom.gov.pl/.
[97] Andrew Clapham, *Human Rights Obligations of Non-state Actors* (OUP, 2006); Math Noortmann, August Reinsich, and Cedric Ryngaert, "Introduction" in Math Noortmann, August Reinsich and Cedric Ryngaert [eds] *Non-State Actors in International Law* (Hart, 2015).
[98] Rojas & Phillips, *supra* note 82.

example, the Chinese government is a Sponsoring State conducting exploration activities. What happens if the Sponsoring State and the contractor(s) differ?[99]

Annex III, Article 4(1) allows the ISA to develop the required standards to establish nationality, control, and sponsorship.[100] Such qualification standards include the financial and technical capabilities of the applicant.[101] The *Exploration Regulations* require that the ISA collect sufficient information to determine the State or States of the applicant's nationality or those nationals who effectively control the applicant, the principal place where the entity is domiciled and does business and, where applicable, the place of registration of the applicant.[102] *Draft Exploitation Regulation* 6 asserts that each application by a State Enterprise, a State, or a private corporation shall be accompanied by a certificate of sponsorship issued by the State of which it is a national or by whose nationals it is effectively controlled. Where an applicant has the nationality of one State but is effectively controlled by another State or its nationals, each State shall issue a certificate of sponsorship.[103] *Draft Exploitation Regulation 6* continues that each certificate of sponsorship shall be duly signed on behalf of the State and shall contain a statement that the applicant is a national of the Sponsoring State or subject to the effective control of the Sponsoring State or its nationals; a statement by the Sponsoring State that it sponsors the applicant; and a declaration that the Sponsoring State assumes responsibility per UNCLOS Articles 139, 153(4) and Annex Article 4(4).[104]

[99] See the discussion of Nauru and NORI, *infra*.
[100] *UNCLOS*, *supra* note 60 at Annex III, 4(a).
[101] *Ibid* at Annex III, Article 4(2).
[102] *Nodules Regulations, supra* note 89 at Regulation 10.3.
[103] *Draft Exploitation Regulations, supra* note 83 at Regulation 6.
[104] *Ibid* at Regulation 6(3).

Two issues arise. First, what is the level of effective control required for State attribution? Second, can a Sponsoring State establish effective control over an entity that is a subsidiary of a much larger corporation domiciled in another jurisdiction?

3.1.1 Effective Control and International Law

UNCLOS Article 304 provides legal responsibility and liability for damage based on international law.[105] Rules of attribution, responsibility and liability generally lie with the State, with limited recourse to non-state actors. Generally, two broad approaches to effective control in international law are regulatory and economic control.[106] The most commonly used criteria for assessing corporate nationality and the home State are the place of incorporation, which is deemed the principal seat of the business, and the nationality of the claimant's owners is not considered.[107] International law gives diplomatic protection to the State under the laws of incorporation and in the territory of its registered office. Nevertheless, no definitive test exists for a "genuine connection" of jurisdiction or control.[108] Regulatory control is thus defined as being wherever the contractor is legally registered, not necessarily where the directing minds are located. Regulatory control is determined by place of incorporation and territoriality.[109]

An economic control approach could include ownership of a majority of the applicant's shares or capital, holding a majority of the voting rights, or holding the right to elect a majority of

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[105] *UNCLOS*, *supra* note 60 at Article 304.
[106] Danielle Amoroso, "Moving towards Complicity as a Criterion of Attribution of Private Conducts: Imputation to States of Corporate Abuses in the US Case Law" (2011) 24:4 Leiden JIL 989 at 990; Philippe Sands, *Principles of international environmental law*, 3rd ed. (Cambridge, 2012) at 51; Sara Seck, *Home State Obligations for the Prevention and Remediation of Transnational Harm: Canada, Global Mining and Local Communities* 2007) [unpublished] at 90.
[107] *Saluka Investments BV v The Czech Republic*, UNCITRAL, (17 March 2006); Elizabeth Whitsitt & Nigel Bankes. "The Evolution of International Investment Law and its Application to the Energy Sector" (2013) 51:2 Alta L. Rev. 207 at 211.
[108] Vaughan Lowe, "Injuries to Corporations" in *The Law of International Responsibility* (Oxford University Press, 2010) at 1010; *Barcelona Traction, Light and Power Company, Limited (Belgium v Spain)*, [1970] ICJ Rep 1 at para 70 [*Barcelona*].
[109] ICJ, *Barcelona*, *supra* note 108 at para 70; Seck, *supra* note 106 at 92.

the board of directors.[110] Elements of ownership include whether the entity is public or private, has partial or complete state ownership, has multiple nationalities of the ownership of assets, or has State financial control.[111] It is a closer representation of the genuine connection test; however, it still leaves many gaps in diverse ownership structures.

Technology transfer provisions in UNCLOS use effective control in an economic way, distinct from nationality, and they recognize and limit the extent to which the use of corporate structures could circumvent obligations.[112] The opposite position is taken for the *Mining Code*, including exploration and exploitation, as they take a regulatory control approach. The country that exercises regulatory control is the country of company registration and coincides with the current ISA application procedures.[113] Under the regulatory control approach, effective control is determined by "the act of incorporation, or the conferring of nationality," which, as suggested by the ISA, combined with undertakings given as a Sponsoring State, seems sufficient to establish effective control.[114] The ISA interprets effective control in purely regulatory terms. No contractor has ever been asked to present a sponsorship certificate issued by the controlling State.[115] Regulatory control is thus defined as being wherever the contractor is legally registered, not necessarily where the directing minds are located.

Equating nationality and effective control provides a solution in cases where the state of nationality and operational control are the same. It is unhelpful where the State differs from that

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[110] *Draft Articles on Responsibility of States for internationally wrongful acts, UN GAOR, 56th Sess., Supp. No. 10, UN Doc. A/56/10 (2001*, by ILC at Article 7(18); James Crawford, *State responsibility: the General Part* (Cambridge University Press, 2013) at 127.
[111] *Ibid* at Article 7(18); Crawford, *supra* note 110 at 127.
[112] UNCLOS, *supra* note 60, Annex III, Article 5(3)(c).
[113] *Ibid* at Article 153; Rojas & Phillips, *supra* note 82 at 9.
[114] Rojas & Phillips, *supra* note 82 at 9; ICJ, *Barcelona*, *supra* note 108 at para 70.
[115] Julian Aguon & Julie Hunter, "Second Wave Due Diligence: The Case for Incorporating Free, Prior, and Informed Consent into the Deep Sea Mining Regulatory Regime" (2019) 38:1 Stanford ELJ at 51; *Summary report of the Chair of the Legal and Technical Commission on the work of the Commission* 20th Sess, ISBA/20/C/20 (2014) at para 27.

of registration. The *Mining Code* does not require the ISA to investigate the origins of a corporation's capital or investors or any financial reality of investors and beneficiaries for effective control.[116] This problem becomes clearer when subsidiaries are involved, as described in the contractor section below.

3.1.2 Seabed Advisory Opinion

Part XI of UNCLOS establishes the International Tribunal on the Law of the Sea and the Seabed Dispute Chamber ("SDC").[117] It also recognizes the *locus standi* of non-state actors, including contractors and the ISA.[118] The ITLOS and the SDC can hear cases based on UNCLOS, the *Mining Code*, and "other rules of applicable law not [otherwise] incompatible."[119] Advisory opinions provide an independent judicial review in the interpretation of UNCLOS.[120] However, the chamber shall have no jurisdiction concerning the ISA's exercise of its discretionary powers, and the tribunal is not permitted to substitute its discretion for that of the Authority. Without prejudice to Article 191, in exercising its jurisdiction under Article 187, the Seabed Disputes Chamber shall not pronounce itself on whether any rules, regulations and procedures of the ISA conform to UNCLOS, nor declare invalid any such rules, regulations and procedures.[121]

Many States do not have the technical or financial capabilities to undertake seabed mining.[122] UNCLOS provides a mechanism whereby a party can seek an advisory opinion on a matter of law.[123] In 2009, the nation of Nauru asked the ISA to seek an advisory opinion, as

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[116] Dingwall, *supra* note 4 at 140.
[117] *UNCLOS*, *supra* note 60 at Article 186.
[118] *Ibid* at Article 187.
[119] *Ibid* at Article 293, Annex VI, Statute of the International Tribunal for the Law of the Sea.
[120] Robert Makgill and Ana Linhares, "Deep Seabed Mining: Key Obligations in the Emerging Regulation of Exploration and Development in the Pacific*"* in R. Warner and S. Kaye (eds) *Routledge Handbook of Maritime Regulation and Enforcement* (Routledge, 2016) at 233.
[121] *UNCLOS*, *supra* note 60 at Article 189.
[122] Tim Poisel, "Deep Seabed Mining: implications of Seabed Disputes Chamber's advisory opinion" (2012) 19 Australian International Law Journal 213 at 215.
[123] *UNCLOS*, *supra* note 60 at Article 191.

mandated under Article 191 of UNCLOS, to clarify the liability of Sponsoring States.[124] On 1 February 2011, the SDC released its *Advisory Opinion on State Liability* ("Seabed Advisory Opinion").[125] This advisory opinion illustrates international law principles and norms while advancing international jurisprudence.[126] In addition, it was the first time non-governmental organizations took part in chamber proceedings.[127]

The SDC concluded that Sponsoring States have a due diligence obligation to ensure compliance by sponsored contractors with the contract terms and the obligations set out in the UNCLOS and related instruments.[128] The applicable standard is that the measures must be reasonably appropriate.[129] The Seabed Advisory Opinion also clarified certain jurisdictional issues. The ISA's jurisdiction includes exploring and exploiting minerals from the seabed, including lifting them to the surface. Jurisdiction does not include land processing or transportation from the high seas *supra*jacent to the Area.[130] The SDC determined that exploration and exploitation include the recovery of minerals from the seabed and lifting them to the surface, activities separating water from minerals, separation of minerals and disposal at sea are included in activities of the Area, whereas processing is excluded, transportation *in situ* (connected with extraction and lifting) between installations and vessels on the high seas above the Area is included in activities in the Area, whereas transportation *ex-situ* to unloading points

[124] MacMaster, *supra* note 2.
[125] *Responsibilities and Obligations of States Sponsoring Persons and Entities with Respect to Activities in the Area (Advisory Opinion)*, [2011] ITLOS Case No 17 [*Seabed Advisory Opinion*].
[126] MacMaster, *supra* note 2 at 342.
[127] *Ibid*.
[128] Caroline Foster, "Diminished Ambitions? Public International Legal Authority in the Transnational Economic Era" (2014) 17 J International Economic Law 355 at 364; *Certain Activities Carried Out by Nicaragua in the Border Area (Costa Rica v. Nicaragua*) ICJ Reports (16 December 2015) at para 101, 153; UNCLOS, Annex VI, Article 293.
[129] *Seabed Advisory Opinion*, *supra* note 125 at 44 para 119; Peter Holcombe Henley, "Minerals and mechanisms: the legal significance of the notion of the 'common heritage of mankind' in the advisory opinion of the Seabed Disputes Chamber" (2011) 12:2 Melbourne Journal of International Law 373.
[130] S*eabed Advisory Opinion*, *supra* note 125 at 94–96.

on land is excluded to avoid conflict with the high seas regime.[131] Chapter 5 shows that *in situ* valuations are not allowed in land-based mining. A significant amount of capital is needed for exploitation, as is the potential for significant environmental destruction in these activities. There are thus clear gaps in the ISA's regulatory framework.

The SDC indicates terrestrial mining may have different concerns from seabed mining. The Seabed Advisory Opinion followed the ruling in the *Pulp Mills* case, which also observed a requirement under general international law to undertake an environmental impact assessment where there is a risk that the proposed activity may have a significant adverse impact in a transboundary context, applicable to public and private operators.[132] The general rule in international law is that the liable party must restore the biological diversity of a disturbed site to the condition before the damage occurred, replace the loss of biological diversity with other components, or provide adequate compensation.[133] There is no justification for the contention that general international law precludes compensation for pure environmental damage.[134] The international court observed, "a state is obliged to use all the means at its disposal in order to avoid activities that take place in its territory or any area under its jurisdiction, causing significant damage to the environment."[135] Victim States can recover only reasonable reinstatement costs rather than all reinstatement costs, but it might not be feasible or reasonable to recreate pre-existing physical conditions fully.[136] This debate over responsibility, liability, and insurance for these parties, and the factors of liability and finance, have not been fully

[131] *Ibid* at para 94, 95; Vladimir Golitsyn, "The Contribution of the International Tribunal for the Law of the Sea to the Progressive Development of International Environmental Law" (2016) 46:5 Environmental Policy and Law 292.
[132] Foster, *supra* note 128 at 364; C*osta Rica v. Nicaragua, supra note 128* at para 101, 153.
[133] Ruth MacKenzie, *Liability for Environmental Harm from Deep Seabed Mining Activities: Defining Environmental Damage* CIGI Liability Series for Deep Seabed Mining Report 8 (CIGI, 2019).
[134] *Ibid*.
[135] ICJ, *Legality of the Threat or Use of Nuclear Weapons Advisory Opinion*, *ICJ Reports 1996*, 1 at para. 29.
[136] Jeremy Suttenberg, "Who pays? The consequences of state versus operator liability within the context of transboundary environmental nuclear damage" (2016) 24:2 NYU Environmental Law Journal 201 at 249.

explored in either business or academic literature. The *Seabed Advisory Opinion* identified, in this respect, numerous *a priori* obligations and measures that must be satisfied before seabed mining activity can be permitted (or not).[137] Those States assert they will only support mining in the Area 'if it is demonstrably beneficial to mankind.'[138] They argue that:

> [A] proper reading of the UNCLOS and the Authority's mandate is for the Authority to develop Regulations that enable exploitation in the Area to occur only insofar as there would be (net) benefit to mankind as a whole. This must take into account all parameters set by the UNCLOS, including the effective protection of the marine environment, and ensuring optimum revenues for the Authority for equitable sharing, in accordance with the UNCLOS.[139]

The SDC clarified that the Sponsoring State's obligation "to ensure" is not to achieve, in all cases, the result that a contractor complies with the requirements of UNCLOS. Anton asks whether "residual liability" rests with the state of the origin of extra-territorial harm, which exercises due diligence.[140] Anton concludes that "a significant defect currently exists in the liability framework concerning harm caused by a sponsored entity in the Area. It has the potential to render the liability regime inadequate and ineffective."[141] The SDC observed:

> Unlike terrestrial mining, in which a State generally only risks losing that which it already has (for example, its natural environment), if a developing State can be held liable for activities in the Area, the State may potentially face losing more than it actually has.[142]

The due diligence obligation requires the Sponsoring State to take measures within its legal system. These measures must consist of laws and regulations and administrative measures. However, it is still unclear where the loss should lie for extra-territorial harm, where the State has exercised due diligence of activities under its jurisdiction and control. The *Seabed Advisory*

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[137] *Seabed Advisory Opinion*, *supra* note 125 at paras 107, 120, 121, 140, 117; Makgill & Linhares, *supra* note 120 at 234–236.
[138] African Group, *Request for Consideration by the Council of the African Group's Proposal on the Economic Model/Payment Regime and Other Financial Matters in the Draft Exploitation Regulations under Review*, (9 July 2018) online: https://www.isa.org.jm/files/files/documents/nv.pdf.
[139] African Group, *Submission on the ISA Draft Strategic Plan 2019-2023*, 2018, online: <https://www.isa.org.jm/files/documents/EN/SPlan/Subs/Algeria-obo-AG.pdf>.
[140] Anton, *supra* note 49 at 244.
[141] *Ibid* at 257.
[142] *Seabed Advisory Opinion*, *supra* note 125 at 17.

Opinion noted that UNCLOS creates liability gaps where a State takes all necessary and appropriate measures required by international law, and the blameless actions of the contractor nevertheless cause environmental harm.[143] A liability gap in such a situation cannot be closed by recourse to the Sponsoring State's liability under customary international law. Other gaps exist where a State takes the requisite necessary and appropriate measures and the private operator is blameworthy but insolvent, or its assets are beyond the reach of the Sponsoring State, or where the Sponsoring State has failed to take the required measures, there is no causal link to environmental harm.[144] Under a due diligence standard, neither an injured State nor any state possessing *erga omnes* rights in the event of environmental harm caused in areas beyond national jurisdiction will be able to invoke responsibility to seek reparations.[145] No party may be responsible for environmental cleanup if a contractor is insolvent and a court finds that the due diligence threshold has been met.

There is tension within the ISA about whether seabed mining is promoted or predicated on protecting the marine environment under Part XI. This tension underlines the need for regulatory guidance on strategic environmental goals and precautions to achieve those goals. UNCLOS, *Seabed Advisory Opinion*, and international law identify the relevant obligations. Scientific information, the identification of uncertainty, and value judgements are the muscle and flesh required to give those obligations regulatory body. A Sponsoring State may not be liable if it meets its due diligence obligation. Even if liable, indemnification provisions would override any responsibility. Sun argues that there is a greater chance of the involvement of the Sponsoring State in international legal proceedings than previously thought, including where a

[143] *Ibid* at para 203.
[144] Anton, *supra* note 49; S*eabed Advisory Opinion, supra* note 125.
[145] Anton, *supra* note 49.

Sponsoring State becomes the third party in the current proceedings of its sponsored contractor.[146] These States shall cooperate in implementing the development of international law relating to responsibility and liability for compensation for damage, the settlement of disputes, and the development of procedures for compulsory insurance or compensation funds.[147]

3.1.3 Sponsoring State Legislation and Environmental Protection

The Sponsoring State must guarantee that the contracting entity will respect the Mining Code's rules, regulations, and procedures. States must adopt domestic legislation and national measures in the form of legally binding instruments.[148] The domestic laws of the Sponsoring State (and flag, home, and processing State) are essential for environmental protection.[149] This section reviews the provisions in UNCLOS, international law, and domestic legislation of Nauru, Belgium, and the United Kingdom.[150] These three jurisdictions have contracted with private corporations to conduct seabed mining activities.

States shall ensure that recourse is available for prompt and adequate compensation regarding damage caused by marine environment pollution by natural or juridical persons under their jurisdiction.[151] UNCLOS Article 208 asserts that Coastal States adopt laws and regulations to prevent, reduce and control marine environment pollution arising from or in connection with seabed activities subject to their jurisdiction and from artificial islands, installations, and

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[146] Linlin Sun, "Dispute Settlement Relating to Deep Seabed Mining: A Participant's Perspective" (2017) 18:1 Melbourne Journal of International Law 71 at 94.
[147] UNCLOS, *supra* note 60, Article 235; ILC, *Draft articles on Responsibility of States for Internationally Wrongful Acts*, with commentaries, 53rd Sess, A/56/10 (2001), Article 36; Esa Paasivirta, "The Responsibility of Member States of International Organizations?" (2015) 12:2 International Organizations Law Review 448 at 465.
[148] Hannah Lily, *Sponsoring State Approaches to Liability Regimes for Environmental Damage Caused by Seabed Mining* (Waterloo, ON, CA: CIGI, 2018). A comparison of state legislation will occur in later chapters, where legislation from the United Kingdom, France, Canada, Nauru, and Tonga.
[149] *Ibid*.
[150] Canada does not have seabed mining legislation. For a list of countries and their domestic legislation, see ISA, "National Legislation Database" online: https://www.isa.org.jm/national-legislation-database.
[151] *UNCLOS*, *supra* note 60 at Article 235.

structures under their jurisdiction. Such laws, regulations and measures shall be no less effective than international rules, standards and recommended practices and procedures.[152] Article 209 of UNCLOS declares that States shall adopt laws and regulations to prevent, reduce and control marine environment pollution from activities in the Area undertaken by vessels, installations, structures, and other devices flying their flag or of their registry or operating under their authority.[153] *Draft Exploitation Regulation* 105 states that Sponsoring States shall take all necessary and appropriate measures to secure effective compliance by contractors whom they have sponsored under UNCLOS Part XI, the *1994 Agreement*, the rules, regulations and procedures of the ISA and the terms and conditions of the exploitation contract.[154] The question arises of how this is implemented.

3.1.3.1 Nauru

Nauru is important in several respects. It was the nation to ask the ISA and the ITLOS for an advisory opinion. It currently sponsors Nauru Ocean Resources Inc. (defined in the contractor section below), a subsidiary of a Canadian-based publicly traded multinational corporation. Finally, it triggered the two-year rule. Can a nation with limited human and financial resources govern, oversee, and effectively control a corporation to prevent environmental damage and ensure that damage is remediated should damage occur?

Nauru's legislation states that its objectives are to establish a legal framework for the sponsorship and effective control of contractors. Activities under Nauru's sponsorship in the Area must be carried out under Nauru's effective control by best international practice and in a manner that is consistent with internationally accepted rules, standards, principles and practices,

[152] *Ibid* at Article 208.
[153] *Ibid* at Article 209.
[154] *Draft Exploitation Regulations*, *supra* note 83.

including Nauru's responsibilities under UNCLOS and specifically Nauru's duty to protect and preserve the marine environment.[155] Nauru's legislation creates a regulatory system, designates a responsible authority to licence, monitor and manage Nauru's involvement, and establishes a system for sponsorship applications and the grant of sponsorship certificates.[156] Sponsored Parties will engage in activities under specific and enforceable conditions and provide Nauru with payments for its sponsorship.[157] It also creates a Seabed Minerals Fund for the responsible long-term management of any funds received by Nauru.[158]

Any sponsorship application must be made in writing and must include content that is required by the rules of the ISA for an application for approval of a plan of work to obtain a contract for the proposed Seabed Mineral Activities, along with copies or summaries of any studies conducted by the Sponsorship Applicant or other data concerning the potential impact of the Seabed Mineral Activities on the Marine Environment.[159] Further, the application must indicate the Sponsorship Applicant's proposed methods for financing the Seabed Mineral Activities.[160] This information includes ownership, lease, bond or other arrangements to use vessels and equipment required for the operation of the Seabed Mineral Activities and insurance or contingency funding to cover damage that may be caused by the Seabed Mineral Activities or the costs of responding to an Incident.[161] In other words, no additional information beyond what is required by the ISA is necessary.

Liability rests exclusively on the contractor. A Sponsored Party shall be responsible for the performance of all Seabed Mineral Activities carried out within the Contract Area and their

[155] Nauru, *International Seabed Minerals Act 2015*, No. 26 of 2015, s. 5.
[156] Defined in the contractor section below.
[157] As of 31 May 2022, I could not find any information on such a fund.
[158] Nauru, *International Seabed Minerals Act, supra note 155* ss. 5(2) and 5(3).
[159] *Ibid* at s. 22(1)
[160] *Ibid* at s. 21.
[161] *Ibid* at s. 22(2).

compliance with the rules of the ISA and shall be liable for the actual amount of any compensation, damage or penalties arising out of its failure so to comply, or out of any wrongful acts or omissions in the conduct of the Seabed Mineral Activities.[162] Nauru indemnifies itself against all actions, proceedings, costs, charges, claims, and demands made or brought by any third party concerning a Sponsored Party's Seabed Mineral Activities.[163] Regarding dispute resolution and choice of forum, the legislation provides that any dispute arising between Nauru and another State in connection with Seabed Mineral Activities shall be resolved pursuant to the provisions of UNCLOS. The forum will include the national courts of Nauru and, if unsuccessful, through an application submitted to ITLOS for any case expressly provided for in Part XI of UNCLOS.[164]

Nauru's legislation also explicitly notes that the contractor and the State apply the precautionary approach.[165] This application of the precautionary approach is more robust than any provisions within the United Kingdom or Belgian legislation.

3.1.3.2 United Kingdom

The United Kingdom is a developed country that has a sponsorship license. The legislation in the United Kingdom differs from Nauru's in several material respects. The United Kingdom has enacted the *Deep Sea Mining (Temporary Provisions) Act 1981* and the updated 2014 *Deep Sea Mining Act* that modifies but does not replace the 1981 legislation. The *Deep Sea Mining (Temporary Provisions) Act 1981* details licensing and liability. The legislation states that a person may be guilty of an offence under regulations made under this Act whether or not he is a citizen of the United Kingdom or, in the case of a corporate body, it is incorporated under the

[162] *Ibid* at s. 23.
[163] *Ibid* at s. 29(1).
[164] *Ibid* at s. 54.
[165] *Ibid* at ss. 28(d), 30(e).

law of any part of the United Kingdom.[166] Where a corporation commits an offence and is proved to have been committed with the consent or connivance of, or to be attributable to any neglect on the part of, a director, manager, secretary or other similar officers, both the person and the corporation shall be guilty of that offence and shall be liable to be proceeded against and punished accordingly.[167]

There is one short environmental provision. In determining whether to grant an exploration or exploitation licence, the Secretary of State shall have regard for the need to protect (so far as reasonably practicable) marine creatures, plants and other organisms and their habitat from any harmful effects which might result from any activities to be authorized by the licence.[168] Any exploration or exploitation licence granted by the Secretary of State shall contain such terms and conditions as he considers necessary or expedient to avoid or minimize any such harmful effects.[169]

The *Deep Sea Mining (Temporary Provisions) Act 1981* was enacted prior to UNCLOS and the *1994 Agreement* when environmental protections were less stringent.[170] Unfortunately, the *2014 Deep Sea Mining Act* does not contain environmental protection provisions.[171] The Act focuses on amending provisions to update UNCLOS and the enforceability of the Mining Code and the ISA. For example, the legislation provides that a decision of the SDC of the Tribunal concerning a dispute of a type described in UNCLOS Article 187 may be registered in the courts of the United Kingdom and treated as if it had been originally given by a court of the

[166] *Deep Sea Mining (Temporary Provisions) Act 1981* Ch. 53. S. 14(3).
[167] *Ibid* at *s. 2.*
[168] *Ibid* at s. 5(1).
[169] *Ibid* at s. 5(2).
[170] See the next chapter for the evolution of sustainable development.
[171] The only reference to the environment is an amendment to include Scotland or Scottish Ministers as well as the Secretary of State on the party that can approved a license.

United Kingdom, and may be enforced in the United Kingdom.[172] Moreover, any award made pursuant to UNCLOS Article 188(2)(a), which involves disputes concerning the interpretation or application of contracts, must be treated as valid and enforceable under domestic legislation and international arbitration treaty awards.[173]

3.1.3.3 Belgium

Belgium's deep seabed legislation, passed in 2013, contains sixteen short sections.[174] The legislation recognizes the Common Heritage of Mankind and binds Belgium to the ISA rules, regulations and procedures.[175] Environmental protections include users of these marine spaces, and public authorities must take into account the principle of prevention, the principle of precaution, the principle of sustainable management, the polluter pays principle, and the principle of reparation.[176] The principle of prevention implies that it must act to prevent environmental damage rather than having to repair this damage eventually.[177] The precautionary principle means that preventive measures must be taken when there are reasonable grounds to worry about the pollution of marine spaces, even if there is no conclusive evidence of a causal link between the introduction of substances in marine areas and adverse effects.[178]

The legislation applies the principle of sustainable management in marine areas and implies that natural resources are required to a sufficient extent available to future generations and that the effects of human interventions should not exceed the absorption capacity of the

[172] *Deep Sea Mining Act 2014, Ch. 15 (UK), s. 8A.*
[173] *Ibid* at s. 8C.
[174] *Law of 17 August 2013 concerning the prospection, exploration, and exploitation of the natural resources of the seabed and the subsoil beyond national jurisdiction*, BS 16 September 2013, 65612; *Royal Decree of 4 October 2013 concerning the prospection, exploration, and exploitation of the natural resources of the seabed and the subsoil beyond national jurisdiction*, BS 15 October 2013, 73061.
[175] *Ibid* at ss. 2, 4.
[176] *Ibid* at s. 5.
[177] See Chapter 4 *infra*.
[178] See Chapter 6 for a detailed review of the precautionary approach/principle.

environment of marine spaces. Ecosystems and ecological processes necessary for the proper functioning of the marine environment will be protected, biodiversity will be preserved, and nature conservancy will be stimulated. The polluter pays principle implies that the polluter shall bear the prevention, reduction, pollution control, and damage repair costs. The principle of reparation implies that for any damage or environmental disturbance in marine areas, the marine environment is restored as far as possible in its original state.[179] The legislation allows the government to establish rules relating to the protection of the marine environment, the protection of human life and the conditions that apply to facilities used for activities in the area, which are stricter than the rules, regulations and procedures of the ISA.[180] Unfortunately, these rules only apply to contractors and not the State.[181]

Control is tangentially canvassed in Article 8. An entity may qualify for a Belgian State sponsorship if the applicants meet the requirements of Belgian nationality or are controlled by the Belgian State and meet the qualifying criteria set out in the authority's rules, regulations, and procedures.[182] The application for sponsorship by the Belgian State contains information regarding the financial and technical capacity of the applicant and must include an environmental impact study that conforms to those required by the ISA. This information must make it possible to assess whether the applicant has the means necessary to perform the activities in the work plan.[183] In other words, no new or additional information is required. The Belgians defer to the ISA on issues of effective control and EIAs.

[179] *Law of 17 August 2013, supra note 174* s. 5.
[180] *Ibid* at *s. 6*.
[181] *Ibid* at *s. 7*.
[182] *Ibid* at s. 8.
[183] *Ibid* at s. 8.

The duty to obtain appropriate insurance is explicitly included in the legislation.[184] This provision lists the documents the contractor must provide to the Belgian authorities during its activities, a clause determining the fees that need to be paid and a section formulating sanctions in case of illegal activity.[185] The Belgian law does not include any form of transparency or public participation, denying third-party stakeholders the possibility to assert any rights.[186] Further, it defers all responsibility to the contractor and may run contrary to the *Seabed Advisory Opinion*, as the line of supervision and effective control is unclear.[187] There are other issues. The Federal Parliament of Belgium adopted (16 January 2021) Resolution 55 1687 on deep seabed mining.[188] This resolution requests the Belgium Government to support fundamental scientific research and data collection for further knowledge of the deep sea and the protection of existing marine ecosystems and to continue to respect environmental legislation and the precautionary principle when developing possible exploitation rules for seabed mining to preserve the biodiversity of marine ecosystems. [189]

Nauru and Belgium's legislation represents a microcosm of the problems of seabed mining. Nauru has included environmental protection in its regime but desires economic expansion. The legislation desires environmental protection and polluter pays but asserts that seabed mining is a path to economic development. The legislation only addresses contractors and the State's role as a Sponsoring State.

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[184] *Ibid* at s. 9(2).
[185] *Ibid*.
[186] Klaas Willaert, *Assessment of the Belgian Legislation on Deep Sea Mining* (WWF, April 2019) at 7.
[187] *Ibid*.
[188] Government of Belgium, *Resolution 55 1687*, online: https://www.dekamer.be/kvvcr/index.cfm.
[189] Seas at Risk, *At a crossroads: Europe's role in deep-sea mining* (SAR, 2021).

3.2 Flag and Processing States

There are most likely at least two ships or vessels involved in seabed mineral extraction: the ship or vessel that extracts the material and the second ship transporting the raw ore to a processing facility. Not only is there a second vessel, but the vessel may be owned and operated by a third party. Instead, they will likely lease or charter such a vessel. A ship is a floating piece of national territory over which a Flag State exerts control. Floating platforms usually have a Flag State.[190] The Flag State's responsibility, liability, financing, and insurance requirements are essential to a seabed mining operation.

Flag State liabilities arise from Articles 94, 209(2), 211, and 217 of UNCLOS. States are free to condition the grant of their nationality if they live up to their UNCLOS obligations. Flag States must exercise jurisdiction and effective control.[191] UNCLOS requires each State to fix the conditions to grant nationality to ships, with the provision that a genuine link must exist between the State and the ship.[192] Thus, each vessel in the Area is subject to the exclusive jurisdiction of its Flag State. Ships shall sail under the flag of one State only and, in exceptional cases expressly provided for in international treaties, shall be subject to its exclusive jurisdiction on the high seas. A ship may not change its flag during a voyage or while in a port of call, save for a transfer of ownership or change of registry.[193]

Article 94 of UNCLOS describes the obligations of the Flag State in the effective exercise of jurisdiction and control over its ships. Every State shall effectively exercise its jurisdiction and control over ships flying its flag in administrative, technical, and social matters.

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[190] Erik Rosaeg, "Framework Legislation for Commercial Activities in the Area" in Catherine Banet, ed, *The Law of the Seabed* (Leiden/Boston: Brill, 2020) at 176–177.
[191] *UNCLOS*, *supra* note 60 at Article 94; Pendleton, *supra* note 105 at 501.
[192] *Ibid* at Articles 91, 92, 94.
[193] *Ibid* at Article 92.

Every State shall assume jurisdiction under its internal law over each ship flying its flag and its master, officers, and crew in respect of administrative, technical and social matters concerning the ship.[194] A State which has clear grounds to believe that proper jurisdiction and control concerning a ship have not been exercised may report the facts to the Flag State, which shall investigate the matter and take any action necessary to remedy the situation.[195]

International law varies depending on the context in determining nationality.[196] For example, in M*/V SAIGA (No 2), Saint Vincent,* ITLOS found that there was a need for a genuine link between a ship and its Flag State to secure the implementation of the duties of the Flag State.[197] UNCLOS Article 209(2) provides that Flag States shall adopt laws to prevent, reduce, and control pollution from vessels flying under their flag. The requirements of such laws and regulations shall be no less effective than the international rules, regulations, and procedures. Further, UNCLOS Article 211 provides that States adopt laws and regulations to prevent, reduce, and control marine environmental pollution from vessels flying their flag or their registry. Such laws and regulations shall at least have the same effect as generally accepted international rules and standards established through the competent international organization or general diplomatic conference.[198] Identifying parties with legal interest to bring a damage claim, arguing that the significant challenge is that damage can impact the international community's individual and collective interests, is essential and helps determine the financial requirements of Flag States.[199]

Once loaded onto the production supply vessel, the minerals will be transported to a terrestrially-based processing plant. This processing plant could be located within the

[194] *Ibid*.
[195] *Ibid* at Article 92(4)
[196] Dingwall, *supra* note 4 at 135.
[197] MV SAIGA ITLOS Reports 1999, 10 at para 83; Dingwall *supra note 4* at 31.
[198] *UNCLOS*, *supra* note 60 at Article 211(2).
[199] Dorota Englender et al, "Cooperation and compliance control in areas beyond national jurisdiction" (2014) 49 Marine Policy 186 at 193.

Sponsoring State's territory, the contractor's home State, or in a country wholly unconnected to the contractor or Sponsoring State. The domestic laws of the processing State could influence liability, insurance, environmental impact assessment requirements and financing.[200] To date (22 May 2022), no commercial-scale plants have been designed or built to process polymetallic nodules.[201] Future needs and costs for processing plants have not been ascertained, as pre-feasibility studies for processing plants are planned for the near future.[202] The processing State may add charges, royalties, taxes, or other levies. While processing costs are generally outside the scope of this dissertation, certain financial arrangements will be analyzed. This is due to the nature of the contractor and subcontractor relationships and royalty payments from the ISA and Sponsoring State. The greatest negative environmental and social impacts from seabed mining may occur during the refining/processing stage. If so, then these impacts could add significant costs to a contractor.

3.2.1Jurisdictional Elements From Case 21 Relevant to Seabed Mining

On 2 April 2015, ITLOS rendered an advisory opinion on the rights and obligations of Flag States and Coastal States regarding illegal, unreported, and unregulated ("IUU") fishing within a country's exclusive economic zone ("Case 21").[203] UNCLOS requires a State to fix the

[200] Further discussed in Chapter 5.
[201] Sustainable Opportunities Acquisition Corp, "Amendment No. 3 to FORM S-4 Registration Statement under the Securities Act of 1933 Filed Pursuant to Rule 424(b)(3) Registration No. 333-260126" (28 July 2021) online: https://www.sec.gov/Archives/edgar/data/0001798562/000121390021039153/fs42021a4_sustainableoppo.htm.
[202] TMC claimed it is the first contractor to begin a pre-feasibility study for a processing plant after it signed a non-binding memorandum of understanding on a pre-feasibility study for a processing plant in India;. TMC, "the Metals Company Enters into Business Collaboration MoU with Epsilon Carbon to Complete A Pre-Feasibility Study For the World's First Commercial Polymetallic Nodule Processing Plant in India" (17 March 2022) online: https://investors.metals.co/news-releases/news-release-details/metals-company-enters-business-collaboration-mou-epsilon-carbon; Mining.com "MoU for PFS on world's first deep-sea nodule processing plant" online: https://www.mining.com/the-metals-company-signs-mou-for-pfs-on-worlds-first-deep-sea-nodule-processing-plant/.
[203] *Request for an Advisory Opinion Submitted by the Sub-Regional Fisheries Commission (SRFC) (Advisory Opinion)*, [2015] ITLOS Case No 21 [*Case 21*].

conditions for granting its nationality to ships.[204] States are free to condition the grant of their nationality. This is based on a "legal fiction that a ship is a floating piece of national territory over which the Flag State exerts control."[205] Thus, each vessel in the Area is subject to the exclusive jurisdiction of its Flag State. UNCLOS does not provide the jurisdiction, control, and liability details necessary to create a financial regime. A significant factor enabling IUU fishing to persist is the reliance on Flag States as the primary enforcers of regionally agreed measures. Flag States must ensure that their jurisdiction and effective control are exercised.[206]

Following the approach in the *Seabed Advisory Opinion*, ITLOS concluded that the liability of a Flag State does not arise from the failure of vessels flying its flag to comply with the laws and regulations concerning illegal fishing, as such violation is not *per se* attributable to the Flag State. Rather, liability arises from the failure of the Flag State to meet its due diligence obligations concerning IUU fishing activities.[207] Consequently, the Flag State is not liable if it has taken all necessary and appropriate measures to comply with its due diligence obligations.[208] ITLOS further clarified that where a State transfers fisheries competence to an international organization, the organization, not the State, may face liability.[209] Thus, violations can be attributed to the Flag State only where there is a failure to meet due-diligence obligations concerning illegal fishing.[210]

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[204] *UNCLOS*, *supra* note 60 at Articles 91, 92, 94.
[205] Kristina Gjerde et al, "Ocean in peril: Reforming the management of global ocean living resources in areas beyond national jurisdiction" (2013) 74:2 Marine Pollution Bulletin 540 at 544; Richard Coles & Andrew Serdy, "Ship Registration and Brexit" (2019) 43:2 Tulane Maritime Law Journal 317.
[206] *UNCLOS*, *supra* note 60 at Article 94; Pendleton, *supra* note 105 at 501.
[207] Golitsyn, *supra* note 131.
[208] *Ibid* at 298.
[209] Michael Becker, "Request for an Advisory Opinion Submitted by the Sub-Regional Fisheries Commission (SRFC)" (2015) 109:4 American Journal of International Law 851 at 852.
[210] Golitsyn, *supra* note 131 at 298.

ITLOS further clarified that where fisheries competence has been transferred from a State to an international organization, the organization may face liability, not the Flag State.[211] Case 21 confirmed that the full ITLOS Tribunal, not just the SDC, has jurisdiction to render advisory opinions, a matter of controversy that had previously been untested.[212] ITLOS will likely apply a similar standard for Flag States and seabed mining. Englender et al. consider the absence of an effective exercise of Flag State jurisdiction and suggest that a greater emphasis on dispute settlement mechanisms should accompany more robust compliance control measures.[213]

3.3 Contractors

The contractor will be the primary operator in seabed mining. UNCLOS, Annex III, Article 22, and the Mining Code state that the contractor shall have primary liability for environmental damage and is liable for the actual amount of any damage arising from its wrongful acts or omissions and those of its "employees, subcontractors, agents and all persons engaged in working or acting."[214] Moreover, the Mining Code also contains provisions dealing with effective control. *Draft Exploitation Regulation* 5 states that each application by a State Enterprise or one controlled by a State shall also contain sufficient information to determine the applicant's nationality or the identity of the State(s) by which or by whose nationals the applicant is effectively controlled. This includes its principal place of business or domicile and, if applicable, the place of registration of the applicant.[215]

[211] Becker, *supra* note 209 at 852.
[212] *Ibid* at 851.
[213] Englender et al, *supra* note 199 at 193.
[214] *Draft Exploitation Regulations*, *supra* note 83 at Annex X, Section 7.1.
[215] *Ibid* at Regulation 5.

Thus, the primary liability for environmental harm lies with the contractor.[216] In the event of operator insolvency or financial insufficiency, all parties may bear the remaining costs.[217] Compensation financing schemes and insurance need to cover all potential losses adequately. Financing, insuring, and royalty payments may differ between the States, State Enterprises, and private corporations. Several financial instruments are currently under consideration, including a royalty mechanism, an Environmental Compensation Fund, an Environmental Performance Guarantee, and insurance.[218]

In the 1980s, contractors included Kennecott (part of Rio Tinto), Inco (part of Vale), Deep Ocean Resources Development, and Deep Ocean Minerals Association, a consortium of twenty-seven Japanese companies.[219] Today, there are twenty (20) unique contractors. States or State Enterprises possess the most licenses of the thirty (30) contracts awarded. Fourteen (14) contractors are either State or State Enterprises, five (5) are corporations, and one (1) is the Interocean Metal Joint Organization ("IOM"), the only sponsored entity 'owned' by multiple states.[220] Wholly owned by Bulgaria, Cuba, the Czech Republic, Poland, the Russian Federation and Slovakia, IOM can in most ways, be legally considered a State Enterprise.[221] China, Russia, South Korea, Japan, Brazil, France, and Germany contracted with government departments or State Enterprises. In addition, Japan's Contractor, JOGMEC, supports the overseas development

[216] Davenport, *supra* note 4 at 2; Christiane Ahlborn, "The Rules of International Organizations and the Law of International Responsibility" (2011) 8:2 International Organizations Law Review 397 at 479.
[217] See Chapters 4, 5 and 7 for details. Insurance would be the most likely source for these funds.
[218] These are detailed in Chapter 6.
[219] NY Times, "Ocean Mining Project Is Led by Kennecott" (30 January 1974), online: https://www.nytimes.com/1974/01/30/archives/ocean-mining-project-is-led-by-kennecott.html; OMULUS, Ocean Mining Technology" online: https://www.omlus.com/ocean-minerals-llc-technology/; Richard Payne, Mining the Deep Seabed: The Political, Economic and Legal Struggle" (1978) 40:4 The Journal of Politics 933-955.
[220] Davenport, *supra* note 4.
[221] IOM, *supra* note 96.

of coal mines by Japanese companies to diversify coal sources and increase Japan's independent development ratio for coal.[222]

The line between private and State Enterprises is not clear-cut. There are only three private firms involved in seabed mining to date. This composition of corporate entities fundamentally differs from the land-based mining context, whereby almost all publicly listed corporations have diverse ownership.[223] State Enterprises may have different financing and insurance requirements, making land-based mining finance inappropriate for seabed mining.

I analyze three non-state-owned companies: UK Seabed Resources Ltd., Global Sea Mineral Resources NV, and TMC. Little is known about other entities.[224] UK Seabed Resources Ltd. is wholly owned by Lockheed Martin UK (itself wholly owned by its United States-based parent company Lockheed Martin Corporation).[225] It is the contractor for the United Kingdom and Singapore. Under their Certificate of Sponsorship with the United Kingdom, UK Seabed Resources Ltd. is a duly incorporated and registered company under the laws of the United Kingdom, with its registered office in the United Kingdom; as such, it is a national of the United Kingdom.[226] Its Chairman is a national and resident of the United Kingdom.[227] The company is subject to the effective control and supervision of the Government of the United Kingdom.[228]

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[222] *JOGMEC Integrated Report 2019*, by JOGMEC (2019) at 28.
[223] Lodge, Lily & Symonds, *supra* note 109.
[224] Frik Els, "China to step up deep sea mining efforts" Mining.com (14 March 2023) online: https://www.mining.com/china-to-step-up-deep-sea-mining-efforts/; Wang Yan, "China's deep-sea mining, a view from the top" China Dialogue Ocean (18 October 2019) online: https://chinadialogueocean.net/en/conservation/10891-china-deep-sea-exploration-comra/
[225] Lockheed Martin, "UK Seabed Resources," online: https://www.lockheedmartin.com/en-gb/products/uk-seabed-resources.html. As of March 2023, Lockheed Martin sells deep-sea mining firm to Norway's Loke, see Reuters, "Lockheed Martin sells deep-sea mining firm to Norway's Loke" (16 March 2023) online: https://www.reuters.com/markets/deals/norways-loke-buys-uk-deep-sea-mining-firm-lockheed-2023-03-16/ However, given the date of this dissertation, all references will remain as UK Seabed Resources.
[226] UK Department for Business Innovation and Skills, *Certificate of Sponsorship* (8 February 2013) online: https://www.lockheedmartin.com/en-gb/products/uk-seabed-resources/uk-seabed-resources-documents.html.
[227] *Ibid*.
[228] *Ibid*.

The United Kingdom assumed responsibility for the applicant's activities.[229] Lockheed Martin's Conflict Minerals Report, made under United States *Securities Exchange Act Rule 13p-1*, provides evidence for using minerals.[230] According to Lockheed:

> 3TG are in substantially all our products (and generally are required for their functionality or production as specified under the Rule) included in the Company and Product Overview. These products are collectively referred to in this Report as the "Covered Products." 3TG is not included in the services we provide to our customers. We do not have sufficient information from the Suppliers to determine the source of the necessary 3TG contained in our products. Our due diligence program is designed to conform, in all material respects, with the internationally recognized framework presented by the Organisation for Economic Cooperation and Development (OECD) in the publication OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas: Third Edition, OECD Publishing (OECD Guidance) and the related supplements for 3TG.[231]

The guarantees and indemnities between Lockheed Martin and the UK Government are set out in the legislation.[232] The form of guarantee is not specified, nor are details on what occurs if the guarantee is void. This contract indemnifies any liability of the UK government.[233]

The second firm is Global Sea Mineral Resources NV ("GSR"), a wholly-owned subsidiary of the Belgian firm DEME Group.[234] GSR is the contractor for Belgium and the Cook Islands.[235] Belgium is the Sponsoring State, host, and home State for its seabed mining contract with the ISA. However, the host and home State differ for the Cook Islands. The host State is the Cook Islands, while the home State is Belgium. On 14 January 2013, the ISA and GSR signed a 15-year contract for prospecting and exploration for polymetallic nodules. Under the

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[229] Lockheed Martin, "UK Seabed Resources", online: https://www.lockheedmartin.com/en-gb/products/uk-seabed-resources.html; UK Seabed Resources Ltd (I and II), "Polymetallic Nodules/Clarion Clipperton Fracture Zone" online: https://www.isa.org.jm/map/uk-seabed-resources-ltd-i-and-ii.

[230] The Conflict Mineral Rule (known as the 3TG Rule) requires disclosure of information when a company manufactures or contracts to manufacture products containing Conflict Minerals that may have originated in the Democratic Republic of the Congo and the adjoining countries of Angola, Burundi, the Central African Republic, the Republic of the Congo, Rwanda, South Sudan, Tanzania, Uganda and Zambia. Conflict Minerals refers to gold and columbite-tantalite (coltan), cassiterite, wolframite, or their derivatives, which are limited to tantalum, tin, and tungsten. SEC, "Lockheed Martin" online: https://www.sec.gov/Archives/edgar/data/0000936468/000093646821000050/exhibit101toformsd12312020.htm

[231] *Ibid*. See Chapter 5 for further discussion of securities law and sustainable use of minerals.

[232] *Deed of Guarantee and Indemnity*, Lockheed Martin UK Holdings Limited and the Secretary of State for Business Innovation and Skills, 18 May 2012, Guarantee No 2012-515.

[233] *Ibid* at para 2.1(c).

[234] DEME, "GSR" online: https://www.deme-gsr.com/.

[235] Dingwall, *supra* note 4.

contract, GSR will have exclusive rights to explore polymetallic nodules over 76,728 square kilometres ("km2") of the seabed in the CCZ. When dealing with environmental matters, at least in the precautionary context, cost-effectiveness and risk proportionality are essential ingredients and must be factored in.[236] In other words, financing is a key element of precaution.

TMC holds exploration rights to four areas in the CCZ,[237] is the contractor for Nauru, Tonga, and has a contract with Kiribati.[238] The three subsidiaries of the Metals company are Nauru Ocean Resources Inc. ("NORI"), incorporated as a Nauruan limited company, Tonga Offshore Mining Limited ("TOML"), registered in Tonga, and DeepGreen Engineering Ltd. (registered in Canada but reincorporated in Kiribati.)[239] They claim to be the most environmentally friendly mining operator with the "lightest touch" and assert they will be ready and able to exploit the seafloor commercially, perhaps as early as 2024.[240]

Nauru Ocean Resources Inc. ("NORI") holds exploration rights to four areas in the CCZ to work as Nauru's contractor.[241] The NORI contract area comprises four separate blocks in the CCZ with a combined area of 74,830 km2, about the size of Panama or the Czech Republic.[242] The NORI Area D deposit will likely become the first mining operation.[243] NORI will pay

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[236] Barbara Kwiatkowski, "Southern Bluefin Tuna (New Zealand v. Japan; Australia v. Japan), Order on Provisional Measures (ITLOS Cases Nos. 3 and 4)." The American Journal of International Law 94.1 (2000): 150-55.
[237] AMC Consultants, *Technical Report NORI Area D Clarion Clipperton Zone Mineral Resource Estimate Deep Green Metals Inc.* AMC Project 318010 (Brisbane: Australia, 2019).
[238] TMC, *Sponsorship Agreement dated as of 5 June 2017*, by and Among the Republic of Nauru, the Nauru Seabed Minerals Authority and Nauru Ocean Resources Inc., Filed as Exhibit 10.14 to SOAC, Amendment No. 3 to FORM S-4 Registration Statement under the Securities Act of 1933 Filed Pursuant to Rule 424(b)(3) Registration No. 333-260126 (28 July 2021).
[239] *Ibid* at s. 2, p 7/31.
[240] TMC, *The Metals Company Q3: Unlocking the World's Largest Estimated Undeveloped Source of Battery Metals* (11 November 2022) online: https://investors.metals.co/static-files/a505f68f-9430-412a-9efa-3e9b7887f26a; TMC, *Prospectus Supplement No. 6 (to Prospectus dated July 12, 2022) Filed Pursuant to Rule 424(b)(3)* Registration No. 333-260126 (2022).
[241] AMC Consultants, *supra* note 237 at 1, 8.
[242] TMC, *Contract for Exploration* (Nauru) (22 July 2011) Exhibit 10.15 to SOAC Prospectus, *supra* note 238.
[243] AMC Consultants, *Technical Report Summary, Initial Assessment of the NORI Property, Clarion-Clipperton Zone for Deep Green Metals Inc. made in accordance with the requirements of SEC Regulation S-K (subpart 1300)* AMC Project 321012 (London, 2021) at 1, 8.

Nauru a seabed mineral recovery payment based on the wet tonnes of polymetallic nodules recovered from the tenement area.[244]

The nation of Tonga is a Sponsoring State of Tonga Offshore Mining Limited ("TOML"), which was a member of the Nautilus Minerals Group of companies before Nautilus' bankruptcy and purchase by TMC.[245] TOML holds exploration rights to 75,000km2 of polymetallic nodules ground in the CCZ under a contract with the ISA, signed on 11 January 2012.[246] Unlike Nauru, which has assumed jurisdiction in its courts for issues with NORI, the TOML relationship is governed by, and will be construed according to, the laws of British Columbia, Canada, and the parties irrevocably submit to the jurisdiction of British Columbia.[247]

The TOML group also holds various patents and an application right concerning a prospecting exploration license in the Republic of Kiribati.[248] DeepGreen prepared and funded Kiribati's application to the ISA and received an offtake agreement and a services agreement with Marawa, which grants DeepGreen the exclusive right to carry out all exploration and mining in the Marawa Area and the right to recover any polymetallic nodules by paying the Republic of Kiribati a royalty per wet tonne of polymetallic nodules.[249]

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[244] Cecilia Jamasine, "DeepGreen to make run for battery metals from seafloor", (7 April 2020), online: https://www.mining.com/deepgreen-makes-run-at-battery-metals-from-seafloor/; PwC, "Nautilus Minerals Inc", online: https://www.pwc.com/ca/en/services/insolvency-assignments/nautilus-minerals-inc.html.
[245] Tonga Offshore Mining Limited, Submission BMS-TOM-COR-TEM-0000-001 (2020); PwC, *supra* note 244; Tonga Offshore Mining Limited & Tonga, *Sponsorship Agreement* (2008).
[246] Tonga Offshore Mining Limited, *Re: Developing a Regulatory Framework for Mineral Exploitation in the Area – Report to Members of the Authority and all Stakeholders* (2015).
[247] TOML, *BMS-TOM-COR-TEM-0000-001, supra note 245* at s. 14.
[248] *Ibid*.
[249] *Ibid*, see also Deep Sea Mining Campaign, *supra* note 157 at 9.

TMC is important for several reasons. They are a publicly traded company with extensive financial information to analyze.[250] They are sponsored by Nauru, which triggered the two-year rule,[251] and publish statements such as:

> We view the opportunity to explore and develop a common heritage resource as a privilege which requires that we meet the global best practices to ensure proper development and operation in a way that respects the unique nature of the deep sea environment. We believe that the exploration and development of this resource should be done in a radically transparent way and pursued only if its development is a clear net positive for our planet and its people. That's why we are investing heavily in understanding the lifecycle impacts of this resource compared to the current default option (conventional mining on land). The ISA is currently developing a revenue sharing mechanism for the revenue that is expected to arise from operations involved in the development of Common Heritage resources. In principle, these funds will be shared fairly amongst all nations, and between current and future generations.[252]

3.3.1 Contractors and Effective Control

The language of effective control for seabed mining is not comprehensively researched in the academic literature.[253] However, effective control and home State liability are potentially important for corporate liability. Should a subsidiary company (such as NORI) become insolvent, the parent company, TMC will not be liable under a regulatory control approach.[254] The ISA, to date, has decided that control is regulatory control, in that control is based on where the company is incorporated.[255] The arguments assert that the "home" State is simply the State they incorporate. Thus, the above analysis for Nauru, Canada and DeepGreen may extend to other contractors and States. There is a strong possibility of incorporating in a State of

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[250] TMC, "Home Page" online: https://metals.co/.
[251] TMC, "NORI" online: https://metals.co/nori/.
[252] TMC, "On the Common Heritage of Mankind" (August 2020) online: https://metals.co/on-the-common-heritage-of-mankind/ (accessed 2 January 2023).
[253] Dingwall, *supra* note 4; MacMaster, *supra* note 2; Rojas & Phillips, *supra* note 82.
[254] MacMaster, *supra* note 2; Rojas & Phillips, *supra* note 82.
[255] ISA, *Report of the Chair of the Legal and Technical Commission on the work of the Commission at its session in 2017*, 23rd Sess, ISBA/23/C/13 (2017) at para 23 online: https://ran-s3.s3.amazonaws.com/isa.org.jm/s3fs-public/files/documents/isba-23c-13_5.pdf; ISA, *Monopolization of activities in the Area* ISA 20th Session ISBA/20/LTC/11 (2014) online: https://ran-s3.s3.amazonaws.com/isa.org.jm/s3fs-public/files/documents/isba-20ltc-11_1.pdf; ISA, *Issues related to the sponsorship of contracts for exploration in the Area, monopolization, effective control and related matters*, 22nd Sess, ISBA/22/LTC/13 (2016) online: https://ran-s3.s3.amazonaws.com/isa.org.jm/s3fs-public/files/documents/isba-22ltc-13_1.pdf; ISA, *Report of the Chair of the Legal and Technical Commission on the work of the Commission at its session in 2016*, 22nd Sess, ISBA/22/C/17 (2016) online: https://ran-s3.s3.amazonaws.com/isa.org.jm/s3fs-public/files/documents/isba-22c-17_1.pdf.

convenience. It is difficult to believe that these two small island States can control a corporation based in Canada. If only the State of nationality of the contractor is designated a Sponsoring State, then only that jurisdiction can be liable for non-compliance. Claims enforced against a bankrupt may not occur in the place of incorporation.[256] A seabed mining valuation code would not solve this corporate liability problem. A valuation code may help investors mitigate damages to the parent company and reduce the potential for environmental damage. When the parent company cannot obtain financing, it cannot fund the subsidiary company. Seabed mining would not ensue. No environmental damage would occur.

A contractor is liable for the actual amount of any damage, including damage to the marine environment arising out of its employees' wrongful acts or omissions, subcontractors, agents, and all persons working or acting for them, and must pay the costs of reasonable measures to prevent or limit damage to the marine environment. The contractor must consider any contributory acts or omissions of the ISA and shall indemnify the ISA against all claims and liabilities of any third party arising out of any wrongful acts or omissions of the contractor.

Under the current approach taken by international law and the ISA, the Canadian parent, TMC, would not have liability, nor would Canada (as the state of incorporation) be required to become a Sponsoring State. If the Nauru subsidiary is not sufficiently capitalized and Nauru does not need to provide reparations, damage may go unrepaired. The question arises whether Nauru can exercise effective control over a Canadian company.[257] The contractor may be a thinly capitalized subsidiary of a larger corporation. The operator may not have the resources to

[256] Rosaeg, *supra* note 190 at 178.
[257] The same analysis would apply to Tonga (Tonga Offshore Metals Inc., formerly a subsidiary of Nautilus and now owned by DeepGreen), Singapore (UK Seabed Authority, which itself is a subsidiary of Lockheed Martin).

pay for environmental remediation. Regulatory effective control would shield a home State from responsibility.[258]

It is likely that contractors will not have (or use) all the equipment necessary and will hire sub-contractors with expertise in specific mining areas. DeepGreen, for example, "has chosen an asset-light approach to its operations and has focused on forming deep strategic partnerships with leading offshore companies in every aspect of its operations."[259] Subcontractors are liable for the full extent of any environmental damage.[260] ISA mining contracts create international law rules directly binding corporations.[261] Upon signing an ISA contract, contractors and subcontractors bind themselves to adhere to international legal requirements. The *Nodules Regulations and the Draft Exploitation Regulations*, Standard clauses of contracts, form the basis of any exploration or exploitation agreement.[262] These standard clauses transpose UNCLOS and the *1994 Agreement* into binding contractual obligations and provide the nexus required by international law for non-state actor liability.[263] TMC is subcontracting to Allseas Group S.A., a Swiss company with its registered office in Switzerland. Allseas will conduct and provide equipment and the services necessary for a pilot mining testing program for the NORI D area. [264]

The *1994 Agreement* downgraded the Enterprise from being an autonomous organ to becoming a part of the Secretariat of the ISA.[265] While the Enterprise is stated to have separate

[258] Rojas & Phillips, *supra* note 80 at 10; Dingwall, *supra* note 4.
[259] SOAC, *Prospectus*, *supra* note 238.
[260] *UNCLOS*, *supra* note 60 at Annex III, s. 2; *Draft Exploitation Regulations*, *supra* note 83 at Annex X, s. 7.1.
[261] Dingwall, *supra* note 4 at 146, Markos Karavias, *Corporate Obligations under International Law* (OUP, 2013) 121
[262] *Polymetallic Nodules Regulations, supra* note 89; *Draft Exploitation Regulations*, *supra* note 83.
[263] Karavias, *supra* note 262 at 124, Seabed Advisory Opinion, *supra* note 125 at para 75.
[264] TMC, *Strategic Alliance Agreement* by and between DeepGreen Metals Inc. and Allseas Group SA (29 March 2019); TMC, *Pilot Mining Test Agreement* by and between DeepGreen Metals Inc. and Allseas Group SA (8 July 2019); TMC, *Third Amendment to Pilot Mining Test Agreement and First Amendment to Strategic Alliance Agreement* by and between DeepGreen Metals Inc. and Allseas Group SA (4 March 2021).
[265] *1994 Agreement*, *supra* note 68 at Annex, s. 2(1).

responsibility from the ISA, international law may attribute responsibility to the ISA if it exercises effective control. This is problematic given the Enterprise's current financing, funding, and lack of expertise. The lack of separation between the Enterprise and the ISA has other potential consequences. It has negative implications for the Common Heritage of Mankind principle, as the fundamental overarching principle governing the regime of the Area, as we know that the goal of the royalty system is to maximize the value of the ISA.[266]

The current lack of uniform rules for a financial and liability system opens the door for forum shopping.[267] Private contractors may look for States with weak domestic legislation, which may not provide substantial contractor oversight.[268] Contractors based in another country may incorporate a subsidiary to escape liability. What happens if a contractor is based in a State that is not an UNCLOS State Party?

3.4 Non-Parties and Other Stakeholders

Are States not parties to UNCLOS and the *1994 Agreement* potentially bound by it? The United States, for example, is not a party to UNCLOS, and the parent company of UK Seabed Resources Ltd. is Lockheed Martin Corporation, a United States corporation. Part XII of UNCLOS imposes a general obligation on States to protect and preserve the marine environment.[269] The *South China Sea Arbitration* underlined the broad jurisdiction of Part XII, stating that its obligations apply to all States with respect to the marine environment in all maritime areas.[270] The Tribunal stated that:

> Article 192 of the Convention provides that "States have the obligation to protect and preserve the marine environment." Although phrased in general terms, the Tribunal considers it well established that Article 192

[266] Daniel Wilde, "An Evaluation of the Payment Regime for Deep Seabed Polymetallic Nodule Mining in the Area" in R Sharma, ed, *Perspectives on Deep-Sea Mining* (Springer, 2022).
[267] Davenport, *supra* note 4 at 11, 17, 24.
[268] Davenport, *supra* note 4 at 21.
[269] *UNCLOS*, *supra* note 60 at Article 192.
[270] *Arbitration Between the Republic of the Philippines and the People's Republic of China*, PCA Case No. 2013-19, Award (July 12, 2016) at para. 940.

> does impose a duty on States Parties, the content of which is informed by the other provisions of Part XII and other applicable rules of international law. This "general obligation" extends both to "protection" of the marine environment from future damage and "preservation" in the sense of maintaining or improving its present condition. Article 192 thus entails the positive obligation to take active measures to protect and preserve the marine environment and by logical implication, entails the negative obligation not to degrade the marine environment.[271]

UNCLOS Article 139(2) specifically uses the term State Party for liability for damage. Article 8 of the *1994 Agreement* defines "States Parties" means States which have consented to be bound by this Agreement and for which this Agreement is in force.[272] UNCLOS Article 137 prohibits mining activities outside the sponsorship regime and refers to States.[273] This provision means that parts of UNCLOS may apply to all States, not just State Parties.[274] While there may be some basis to argue that Article 137 binds all States, Dingwall argues that this "would be a difficult position to sustain."[275] The United States signed the *1994 Agreement*, albeit it was never ratified.[276] The United States is an observer in the ISA and is taking part in developing environmental and financial provisions.[277] The United States informally acknowledged that it could not mine the Area without a license from the ISA, and to get a license, it would need to formally ratify UNCLOS and the *1994 Agreement*.[278]

The ISA pays particular attention to ensuring the active participation of all stakeholders. The list of potential stakeholders who have an interest or stake in seabed mineral exploitation

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[271] *Ibid* at para. 941.
[272] *1994 Agreement*, *supra* note 68.
[273] *UNCLOS*, *supra* note 60; Dingwall, *supra* note 4.
[274] Dingwall, *supra* note 4 at 152.
[275] *Ibid* at 154.
[276] MacMaster, *supra* note 2 at 344, 348, 353.
[277] National Archives, "International Seabed Authority" (28 February 2022), online: https://www.federalregister.gov/documents/2022/02/28/2022-04295/international-seabed-authority, ISA, IWG *Environment Informal working group on the protection and preservation of the marine environment* – IWG ENV, United States Comments, online: https://isa.org.jm/node/20859.
[278] *Deep Seabed Hard Mineral Resources Act*, 30 USC 1401-1473 (enacted 28 June 1980), NOAA*, Deep Seabed Mining Regulations for Exploration Licenses* 15 Code of Federal Regulations s 970.100 2016, US *Draft Regulations on Exploitation of Mineral Resources in the Area – United States Comments*, October 2019, US Department of Commerce, NOAA, Deep Seabed mining – Report to Congress.

activities will be wide and varied.[279] Ongoing consultations continue for the *Draft Exploitation Regulations* and the *Draft Standards and Guidelines*. ISA's consultations are used to support the implementation of the *Draft Exploitation Regulations* and other key strategic documents and initiatives, such as developing regional environmental management plans.[280] Stakeholders include State Parties, members and observers of the ISA, as well as non-governmental organizations, regional groups such as the African Group, international organizations such as the International Maritime Organization, academics and others.[281] There remains an incongruence between UNCLOS, international law, environmental protection, and the workings of the ISA. Problems that remain include the lack of uniformity in Sponsoring State legislation, the possible immunity of ISA, and financial provisions.

[279] ISA, *Developing a Regulatory Framework for Mineral Exploitation in the Area, Stakeholder Engagement* (2014).
[280] ISA, "ISA opens draft Communications and Stakeholder Engagement Strategy for public consultation" (7 December 2020) online: https://www.isa.org.jm/news/isa-opens-draft-communications-and-stakeholder-engagement-strategy-public-consultation/.
[281] ISA, *Comments on the draft regulations on the exploitation of mineral resources in the Area* ISBA/26/C/2 (2 December 2019); ISA, "Stakeholders Invited to Comment on Revised Draft Regulations on Exploitation of Mineral Resources in the Area" online: https://www.isa.org.jm/news/stakeholders-invited-comment-revised-draft-regulations-exploitation-mineral-resources-area/; for a list of who made submissions and the content of these submissions, see: *Submissions to ISA, Request for Comment*, ISBA/24/LTC/WP.1/Rev.1) online: https://www.isa.org.jm/wp-content/uploads/2022/04/comments_0.pdf.

Chapter 4 – Land Based Mining Valuation

The fundamental asset which underpins the value of any mining project is its mineral reserve.[1]

Mineral Resources and Mineral Reserves (defined below) are the most significant assets for any company in the minerals industry. The largest source of risk is the lack of knowledge of the quality and quantity of ore to be mined.[2] Given the long running nature of a mining operation, any change to environmental regulations may add material risk to mining projects, as changes may increase business costs or make it impossible to continue a particular operation.[3] An accurate valuation model to price minerals is important for companies and investors.[4]

Chapter 4 discusses Pistor's Legal Theory of Finance as finance is dependent on the law. Canadian and United States securities law is analyzed, emphasizing environmental and social disclosures and valuation codes. More than 59% of the world's extractive financings occur on the Toronto Stock Exchange ("TSX") or TSX-Venture exchange.[5] Canada has a seat on the ISA Council and exports a significant quantity of raw ore from mining operations.[6] TMC is publicly

[1] C.R. Lattanzi, *Discounted Cash flow Analysis Input Parameters and Sensitivity* (CIM, 2002) online: https://store.cim.org/fr/discounted-cash-flow-analysis-input-parameters-and-sensitivity.
[2] G Njowa & C Musingwini, "A framework for interfacing mineral asset valuation and financial reporting" (2018) 56 Resources policy.
[3] Michael Seeger, *Mining Capital* (Switzerland: Springer, 2019); Elizabeth Whitsitt & Nigel D Bankes, "The evolution of international investment law and its application to the energy sector" (2013) 51:2 Alberta Law Review 247.
[4] Chang Xiao, Ionut Florescu & Jinsheng Zhou, "A comparison of pricing models for mineral rights: Copper mine in China" (2020) 65 Resources policy 101546.
[5] TMX, "TMX TSX | TSXV - Mining," online: https://www.tsx.com/listings/listing-with-us/sector-and-product-profiles/mining; Deloitte, "London – Mining's Finance Capital" online: https://www2.deloitte.com/uk/en/pages/energy-and-resources/articles/london-global-hub-for-mining-finance.html; Julian Turner, "Capital gains: Why London remains the premier global hub for mining finance" Progressive Digital Media Oil & Gas, Mining, Power, Cleantech and Renewable Energy News (1 September 2014) online: https://www.mining-technology.com/analysis/featurecapital-gains-why-london-remains-the-premier-global-hub-for-mining-finance-4351122/.
[6] ISA, "Council" online: https://isa.org.jm/index.php/authority/council/members; Government of Canada, "UNCLOS" online: https://www.canada.ca/en/environment-climate-change/corporate/international-affairs/partnerships-organizations/law-sea-united-nations-convention.html.

listed in the United States.[7] Reserves, resources, and valuation requirements are analyzed, as are the paucity of environmental and social considerations. The chapter concludes with an overview of royalties and taxes. Royalties depend on the valuation of mineral resources. A valuation code will assist the ISA in creating a royalty regime.

4.0 The Legal Theory of Finance

The Legal Theory of Finance ("LTF") developed by Katharina Pistor in 2013 asserts that finance is legally constructed and does not stand outside the law.[8] Law is central to finance as it lends authority to the means of payment, spurs regulatory pluralism by delegating rulemaking to different stakeholders, and legally supports financial instruments and other financial contracts.[9] Financial assets depend on being legally vindicated. Traditional assets coded as capital include land, equity, debt, and know-how.[10] Law involves State and private arrangements.[11] Pistor argues that the critical role of the State and law is missing in this social relationship.[12]

According to Pistor, assets have priority (creditor ranking in case of bankruptcy), durability (protection of assets over time), and enforceability.[13] Capital requires the State, and any financial agenda features a mixture of public and private sector provisions supported by legal

[7] TMC, "Company" online: https://metals.co/company/; EDGAR, *TMC the Metals Company Form 8-K, Pursuant to Section 13 OR 15(d) of the Securities Exchange Act of 1934* (14 March 2022) online: https://www.sec.gov/edgar/search/#/ciks=0001798562&entityName=TMC%2520the%2520metals%2520Co%2520Inc.%2520(TMC%252C%2520TMCWW)%2520(CIK%25200001798562).
[8] Katharina Pistor, "A legal theory of finance" (2013) 41:2 Journal of Comparative Economics 315.
[9] *Ibid*.
[10] Katharina Pistor, *Code of capital: how the law creates wealth and inequality* (Princeton University Press, 2019); Dick Bryan & Michael Rafferty, "Financial derivatives and the theory of money" (2007) 36:1 Economy and Society 134.
[11] Simon Deakin et al, "Legal institutionalism: Capitalism and the constitutive role of law" (2017) 45:1 Journal of Comparative Economics 188; Ruth Aguilera & Cynthia Williams, "Law and finance: inaccurate, incomplete, and important. (Evaluating Legal Origins Theory Symposium)" (2009) 6 BYULR 1413.
[12] Katharina Pistor, "Capital's global rule" (2019) 26:3 Constellations 430–441 at 436; Pistor, *supra* note 8 at 326.
[13] *Ibid* at 430.

and regulatory adjustments.[14] The LTF illuminates the core features of a financial system, including its inherent instability.[15] In particular, the LTF emphasizes the State's role in creating the legal system, constitutive to developing the law's role in social and economic life.[16]

Banking and investment form part of Pistor's LTF. Banking is essential in financing investment, yet it can create or enlarge financial instability.[17] An investor is betting on an unpredictable future and must accept the project's risk, including liquidity risk.[18] Developers must measure, minimize, or manage risk through risk transference, reduction, avoidance, and acceptance to assure potential investors and attract capital.[19] The recent public listing of the TMC is illustrative. TMC's mineral valuation has come under intense scrutiny by the Securities and Exchange Commission in the United States (detailed below), resulting in a potential class-action lawsuit.[20]

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[14] Iris H-Y Chiu, Andreas Kokkinis & Andrea Miglionico, "Debt Expansion as 'Relief and Rescue' at the Time of the Covid-19 Pandemic: Insights from the Legal Theory of Finance" (2021) 28:1 Indiana journal of global legal studies 29 at 33; Marcos Reis & Daniel Vasconcelos, "The legal theory of finance and the financial instability hypothesis: Convergences and possible integration" (2016) 39:2 Journal of Post Keynesian Economics 206 at 216.
[15] Katharina Pistor, *Lecture to Duke University's School of Law* (11 February 2020) online: https://www.youtube.com/watch?v=kwfRVIpwbvA&t=198s.
[16] Deakin et al, *supra* note 11 at 198–199; Chiu, Kokkinis & Miglionico, *supra* note 14 at 37.
[17] Reis & Vasconcelos, *supra* note 14 at 208, 209; Lawrence A Cunningham, "Capital market theory, mandatory disclosure, and price discovery" (1994) 51:3 Washington and Lee Law Review 877.
[18] Hyman Minsky, Irwin Friend & Victor Andrews, "Financial Crisis, Financial Systems, and the Performance of the Economy" (1960) Private Capital Markets; A Series Of Research Studies Prepared For The Commission On Money And Credit, online: https://digitalcommons.bard.edu/hm_archive/232; Simon Deakin, "The legal theory of finance: Implications for methodology and empirical research" (2013) 41:2 Journal of Comparative Economics 338.
[19] Keith MacMaster, "Responsible Investing: Access Denied" (2019) 34:3 Banking & Finance Law Review 387–415.
[20] Block Leviton, *Carper v. TMC the metals company Inc. et al., (Case No. 1:21cv05991*), E.D.N.Y. online: https://www.blockleviton.com/cases/tmc; Campaign, "Watchdog Requests SEC Investigate Undisclosed Histories of Deep Sea Mining Companies Seeking Merger" (22 July 2021) online: https://campaignforaccountability.org/watchdog-requests-sec-investigate-undisclosed-histories-of-deep-sea-mining-companies-seeking-merger/; Newfile Corp., *Investigation: Block & Leviton Is Investigating TMC The Metals Company For Potential Securities Law Violations; Investors Who Have Lost Money Are Encouraged to Contact the Firm* (20 October 2021) online: https://finance.yahoo.com/news/investigation-block-leviton-investigating-tmc-173000491.html?guccounter=1&guce_referrer=aHR0cHM6Ly9pbnZlc3RvcnBsYWNlLmNvbS8&guce_referrer_sig=AQAAABfK-SErcpj0khCd2PsKRkC7ptK9W3wVotolSWXiNPYcKmJYqUozZLsNoABODUh-5DoEjHxUoXMNCW-YhMmJTluInI0q0iHnIQWadIDsNBZqkuw9xVHe3mCUEPIc-EKvNmeClw_S5irXWLf9KPR1Fe5lTDwVaorzAPOYKLu0Ru4m; Louis Navelier, "TMC Is Drowning in Legal Woes and Environmental Concerns" (25 October 2021) online: https://investorplace.com/2021/10/tmc-stock-is-drowning-in-legal-woes-and-environmental-concerns/.

The LTF helps show that new approaches to financial regulation, which recognize the interdependencies of financial instruments, markets and regulators, are required.[21] Mining laws influence mining finance.

4.0.1 Critiques of the LTF

Critiques of the LTF are few as the LTF is new and does not appear to have gained significant traction in the literature.[22] This dissertation could add to the LTF debate. The main critique of the LTF relates to its view that finance is hierarchical, western-based, and treats law as an independent variable that explains how financial actors faced with an impending crisis attempt to enforce or renegotiate contracts that underlie credit transactions.[23] LTF starts from the premise that financial operations are developed and implemented within legal parameters. Deciding whether to borrow more or raise funds from capital markets is influenced by incentives, preferences, and legal and regulatory regimes. Thus, a weakness in the LTF is its application to States such as China. [24]

The second critique that arises then by the LTF is the degree of law's elasticity, i.e., the probability that obligations will be suspended in the future, directly depends on the actor's position in the financial system, where the actors who are crucial for the survival of the financial

[21] Katharina Pistor, "From Territorial to Monetary Sovereignty" (2017) 18:2 Theoretical Inquiries in Law 491–517; Pistor, *supra* note 8 at 329; Mark j Roe, "Corporate Laws Limits" (2002) 31:2 The Journal of Legal Studies 233; I. Chiu, H.-Y., Kokkinis, A., & A Miglionico, "Debt Expansion as "Relief and Rescue" at the Time of the Covid-19 Pandemic: Insights from the Legal Theory of Finance" (2021) 28:1 Indiana Journal of Global Legal Studies 2

[22] Reis & Vasconcelos, supra note 14 at 208.

[23] Geoffrey Ingham, "Further reflections on the ontology of money: responses to Lapavitsas and Dodd" (2006) 35:2 Economy and Society 259; Akos Rona-Tas & Alya Guseva, "Information and consumer credit in Central and Eastern Europe" (2013) 41:2 Journal of Comparative Economics 420–435; Prince Kwasi Sarpong & Jugjith Deodutt, "Legal theory of finance: Evidence from global financial networks" (2019) 7:1 Cogent Economics & Finance at 9; Pistor, *supra* note 13; Geoffrey M Hodgson, "Observations on the legal theory of finance" (2013) 41:2 Journal of Comparative Economics 331–337; D. Awrey, "Three Projects in the New Law and Finance" (2021) 11:1 Accounting, Economics, and Law 9.

[24] Li, C., Zheng, H., & Liu, Y. "The hybrid regulatory regime in turbulent times: The role of the state in China's stock market crisis in 2015–2016" (2022) 16:2 Regulation & Governance, 16(2), 392; Goldmann, M. (2018). United in Diversity? The Relationship between Monetary Policy and Prudential Supervision in the Banking Union. European Constitutional Law Review, 14(2), 283.

system are located at the apex of the hierarchy and enjoy better prospects to escape from the coercive power of law in times of crisis.[25] Regulatory elasticity can alter market dynamics. This increases uncertainty and inconsistency in investor expectations and can divert investor attention toward speculation on selective policy actions. There is a paradoxical relationship between law and finance: legal background secures finance, but strong enforcement of the law (or weak commitment to the law) can break it. However, during the global financial crisis, it was observed that the very qualities of certainty and strict enforceability of financial obligations and transactions in various markets would collectively lead to damaging consequences-a manifestation of systemic risk.[26]

However, seabed mining is a closed system in that risk is managed by the ISA, and the too-big-to-fail model the LTF was based on does not apply. Furthermore, Pistor highlights that 'the critical questions are who exercises it, to whose benefit, how its exercise is legitimated and to whom the power wielders are held accountable.

The most relevant critique is that all of the factors of instability observed by Pistor are external to the law, including the simultaneous enforcement of contractual obligations, as this presupposes an external shock. The legal instability theorem differs from Pistor's account in three respects. First, it focuses on the instability of the law itself rather than on that of financial markets; second, it considers a good deal of the sources of such instability to be endogenous to the law, similar to Minsky's hypothesis, according to which financial instability results from the ordinary operation of financial markets and not necessarily from external shocks; and third, it

[25] A. Gelpern, & Gulati, M. (2013). "The wonder-clause" (2013) 41:2 Journal of Comparative Economics 367; Biljanovska, B. (2016). Aligning Market Discipline and Financial Stability: A More Gradual Shift from Contingent Convertible Capital to Bail-in Measures. European Business Organization Law Review, 17(1-2), 105; Grygoriy Pustovit, "Sovereign Debt Contracts: Implications of Trust Arrangements for Financial (In)stability" Eur Bus Org Law Rev (2016) 17:41–70.

[26] Iris H.-Y. Chiu, Andreas Kokkinis & Andrea Miglionico, "Debt Expansion as "Relief and Rescue" at the Time of the Covid-19 Pandemic: Insights from the Legal Theory of Finance" (2021) 28 IND. J. GLOBAL LEGAL Stud. 291

considers issues of democratic legitimacy as a main driver of change, not merely power as defined by the financial hierarchy.[27]

Using formulae in regulations is a weakness. Instead of a vague term like price stability or Common Heritage of Mankind, the ISA might adopt a legal provision that stipulates a target of close to 2% or a formula. Each regulation is part of a context of rules that lend themselves to systematic interpretation. Thus, in theory, even a numerical rule might have to give precedence to another legal principle, and that debate over equitable sharing may prevail over a formula that would provide the intended sharing.

Yet, questions remain about the framework's robustness, related to its assumption that economic and political partial policy actions necessarily 'abrogate' or negate the power of policy elites 'to do what it takes to rescue the system.'[28] However, this critique is well beyond the scope of this dissertation.

4.1 Investor Motivations, Mining Stages and Types of Investment

Investors split the sector into two main groups: majors and juniors.[29] Majors are less volatile and more mature, with a large portfolio of claims and a capital cushion used to finance further exploration. The majors are well-capitalized companies with decades of history, world-spanning operations, and slow and steady cash flow. Major mining companies have proven and probable

[27] Matthias Goldmann, "United in Diversity: The Relationship between Monetary Policy and Prudential Supervision in the Banking Union" (2018) 14 EuConst 283.
[28] N. Dorn, "Legal "Elasticity" and "Sidestepping" in European Crisis Management of Financial Markets" (2015) 21:6 European Law Journal: Review of European Law in Context 787.
[29] Investopedia, "Beginners Guide to Mining Stocks" online: https://www.investopedia.com/articles/basics/12/beginners-guide-mining-stocks.asp.

reserves. Majors break down profit and cost on a given deposit by the tonne.[30] In short, due to their known mineral deposits, valuing a mining major is relatively straightforward.

Junior mining companies are very nearly the exact opposite of mining majors. They tend to have little capital, short histories, and high hopes for huge returns in the future. Juniors are riskier ventures, as they are smaller companies developing or seeking to develop a natural resource deposit or field. The most common concern of a junior mining company is failure.

Although majors and juniors are very different, they have similar traits that make all mining stocks unique: their business model is based on the economically exploitable assets they have in the ground. However, mining companies do not know exactly how much is in a given deposit until it is extracted. How certain a company is on the amount (and hence value) of ore in the ground (or seabed) influences a project's valuation. Changing the economics of exploitation over the operating life of a project influences value. Ore that was not economically extractible the day a mine opens can become so over time due to rising prices for the ore or dropping extraction costs. The amount of ore, revenue, and costs (including taxation and royalties, the vigour of environmental assessments, ongoing environmental monitoring, and contractual certainties) help investors develop a cash flow analysis used to price a project. Alternative financing forms, including farm-in agreements and offtake finance, can be used as a proxy for cash flows.[31] Offtake agreements are discussed below, as they assist in creating pricing certainty and can help a nascent industry like seabed mining price an asset more accurately and reliably.

[30] Seeger, *supra* note 3; Sebastian Volkmann, Blue Mining—Planning the Mining of Seafloor Manganese Nodules (PhD Thesis, RWTH Aachen University, 2018) [unpublished].
[31] Peter Buchholz et al, "Leaning against the wind: low-price benchmarks for acting anticyclically in the metal markets" (2019) 33:1–2 Miner Econ 81–100.

4.2 Securities Laws Disclosure and Mineral Asset Valuation Codes

Securities laws are designed to protect investors from unfair, improper or fraudulent practices and foster fair and efficient capital markets and confidence in capital markets.[32] The broad definition of security underlies securities law's investor protection and risk mitigation purposes.[33] An initial public offering of an extractives firm generally allows companies greater access to the world's equity markets to gain access to additional capital and lower borrowing rates than other companies in other industries.[34] The disclosure requirements from a public listing allow additional credit lending facilities to be more readily available and at lower interest/borrowing rates than similarly sized privately held firms.[35] Large enterprises that can provide audited financial statements are more likely to obtain external financing without offering collateral.[36] The lower the cost of borrowing, the more profitable a project should be.

Securities law comprises securities legislation (which in Canada is provincial), regulations and National Instruments, which have the force of regulation.[37] Investors, banks and other financiers cannot make informed, meaningful investment choices unless they obtain all necessary and relevant information. Timely, accurate, and efficient disclosure of information and data is one primary way to achieve the goals of securities legislation.[38] Companies must

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[32] Christopher Nicolls, *Securities Law*, 2nd ed (Toronto: Irwin Law, 2018); *Securities Act*, RSNS 1989, c 418 at ss. s1A (1), 1.2(aab); CSA, *A Provincial/Territorial Memorandum of Understanding Regarding Securities Regulation (2004); Securities Act*, RSO 1990, c S5 at ss 1.1, 143(13).
[33] Nicolls, *supra* note 32 at 7.
[34] TSX, "The World's Public Mining Companies are listed on the TSX and TSXV" online: https://www.tsx.com/listings/listing-with-us/sector-and-product-profiles/mining; Forbes, "What is an IPO?" online: https://www.forbes.com/advisor/investing/initial-public-offering-ipo/; SEC, "Investing in an IPO, Investor Bulletin" online: https://www.sec.gov/files/ipo-investorbulletin.pdf.
[35] CBJ, "Why List on the TSX?" Canadian Business Journal (11 February 2022) online: https://www.cbj.ca/the_advantages_of_resource-based_exchanges_the_tsx_and_tsx-ventu/.
[36] Rainer Haselmann, Katharina Pistor & Vikrant Vig, "How Law Affects Lending" (2010) 23:2 The Review of Financial Studies 549.
[37] Nicolls, *supra* note 32; *Securities Act supra* note 32 at s. 1.1, 143(13); *Securities Act*, *supra* note 32 at ss. 1A(a), 1.2); MacMaster, *supra* note 20 at 396.
[38] *Continuous Disclosure Obligations*, OSC NI 51-102 (30 June 2015) Form 51-102F2, Item 5.2; Nicolls, *supra* note 32 at Ch. 5, 6 & 9; *Securities Act*, *supra* note 32 at s. 2.

disclose material information when they list on public markets.[39] Material information is defined as any information or change in the issuer's business, operations or capital that would reasonably be expected to have a significant effect on the market price or value of any of the issuer's securities.[40] It includes all relevant information that investors and their professional advisors would reasonably require and expect to find in a valuation report to make a reasoned and balanced judgement regarding investment in a project.[41] According to Professor Ford, "core definitions of materiality and disclosure should be broad and principles-based."[42]

Determining the materiality of information is crucial regarding whether environmental or social factors need to be disclosed.[43] A general rule in determining information's materiality level is whether omission or misstatement could significantly influence investors' decisions.[44] Determining material information for valuation depends on qualitative and quantitative factors, and professional judgment is required. Two tests may be used, including a qualitative test (the nature of the item and whether knowledge of it would influence users' decisions) and a quantitative test expressed as a percentage.[45] A parameter may be material in the qualitative due to its nature, such as country risk.[46] Issuers must provide evidence in a quantitative risk model.[47]

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[39] *NI 51-102*, *supra* note 32; *Part 210—Form and Content of and Requirements for Financial Statements, Securities Act of 1933, Securities Exchange Act of 1934, Investment Company Act of 1940, Investment Advisers Act of 1940, and Energy Policy and Conservation Act of 1975 - Regulation S-X*, 17 CFR Part 210 at Rule 405.
[40] *Securities Act*, *supra* note 32 at 1.1.
[41] *Standards of Disclosure for Mineral Projects, Form 43-101F1 Technical Report and Related Consequential Amendments NI 43-101 at* General Guidance (4) and (5) of Companion Policy.
[42] Cristie Ford, "Principles-Based Securities Regulation in the Wake of the Global Financial Crisis" (2010) 55 McGill LJ 257 at 268.
[43] *Disclosure Standards*, OSC NP 51-201 (12 July 2002).
[44] *Ibid*.
[45] Part 229—*Standard Instructions for Filing Forms Under Securities Act of 1933, Securities Exchange Act of 1934 and Energy Policy and Conservation Act of 1975* - Regulation S-K, 17 CFR Part §229 at s 229.1301.
[46] *Ibid* at Item 305.
[47] *Ibid* at Item 392 and §229.601; *CIMVAL Code for the Valuation of Mineral Properties* (CIMM, 2019) at 28.

4.2.1 Canada

A material fact is defined as "a fact that would reasonably be expected to have a significant effect on the market price or value of the securities."[48] There are typically two types of documents: the initial documentation or prospectus and the ongoing continuous disclosure documents.[49] The prospectus must provide full, true and plain disclosure of all material facts relating to the securities issued or proposed to be distributed.[50] Any material fact or material change is required to be disclosed. A material change is defined as any change in the issuer that would reasonably be expected to have a "significant effect on the market price or value of a security of the issuer" or "whether a reasonable investment fund considers it important in determining whether to purchase or hold the security."[51]

Additional disclosure requirements are mandated for extractive-based industries. In 2001, *Standards of Disclosure for Mineral Projects* ("NI 43-101") came into effect.[52] Under NI 43-101, a technical report detailing all material aspects of an extractive firm and its assets must be filed for anyone issuing securities or where a special transaction occurs.[53] Special transactions include insider takeover bids, business combinations, and issuer bids.[54] TMC completed the *NORI Area D Clarion Clipperton Zone Mineral Resource Estimate*, dated 22 July 2019 and updated on 31 March 2021.[55] Valuation codes lie at the heart of a technical report.

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[48] *Securities Act*, *supra* note 32, s 1.1.
[49] *NI 51-102*, *supra* note 32 at s. 4(A.3); Continuous Disclosure Obligations CP 51-102CP (30 June 2015).
[50] *Securities Act*, *supra* note 32 at 61(1).
[51] *Ibid* at s 2.1(v).
[52] NI 43-101, *supra* at *Form 43-101F1 Technical Report and Related Consequential Amendments*.
[53] A special transaction occurs when a purchaser of a particular asset has advantages from its own that would not be available to other buyers in the market, *Take-Over Bids and Issuer Bids*, BCSC MI 62-104 (9 May 2016), *Protection of Minority Security Holders in Special Transactions and Related Companion Policy* 61-101CP *Protection of Minority Security Holders in Special Transactions* OSC MI 61-101 (1 February 2008).
[54] This occurred when DeepGreen purchased the assets of Nautilus Minerals.
[55] AMC Consultants, *Technical Report Summary, Initial Assessment of the NORI Property*, Clarion-Clipperton Zone for Deep Green Metals Inc. made in accordance with the requirements of SEC Regulation S-K (subpart 1300) AMC Project 321012 (London, 2021) ; AMC Consultants, *Technical Report NORI Area D Clarion Clipperton Zone*

Companies listed on the TSX have additional required disclosure obligations.[56] The TSX standards aim to set out the requirements when a company provides information to investors, regulators, and the media regarding its properties, whether such information is contained in a news release, a continuous disclosure document such as an annual report, or another form of communication.[57] The standards set out the requirements of the TSX when a company provides information to investors, regulators and the media regarding its properties, whether such information is contained in a news release, a continuous disclosure document such as an annual report, or other forms of communication, such as printed investor relations/marketing material and internet web sites.[58] As the TSX is separate from securities commissions, a separate policy of the TSX states that all persons investing in securities listed on the TSX have equal access to information that may affect their investment decisions. Public confidence in the integrity of the TSX requires timely disclosure of material information concerning the business and affairs of the companies listed, thereby placing all participants in the market on an equal footing.[59]

4.2.2 United States

United States securities laws require publicly traded businesses to file extensive disclosures about their operations, capital structure, financial performance and provide periodic updates.[60] Prospectus and continuous disclosure obligations in the United States are similar to those in

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Mineral Resource Estimate Deep Green Metals Inc. AMC Project 318010 (Brisbane: Australia, 2019); DeepGreen, "DeepGreen Metals Inc. Profile", online: https://www.sedar.com/DisplayProfile.do?lang=EN&issuerType=03&issuerNo=00044394. These securities law disclosures reveal a substantial information, much more than the ISA publishes. TMC is subject to both terrestrial mining codes, securities law requirements and the ISA framework. Other contractors are not. TMC is an ideal firm to show gaps in the current framework, in land-based mining and seabed mining.

[56] TSX, *Disclosure Standards for Companies Engaged in Mineral Exploration, Development & Production, Appendix B (1 July 2002) online: https://mrmr.cim.org/media/1018/tsx-appendix-b.pdf*.

[57] CIM, "*Canadian Securities Regulatory Standards for Mineral Projects"* online: https://mrmr.cim.org/en/standards/canadian-securities-regulatory-standards-for-mineral-projects/.

[58] TSX, *supra* note 56 at 2.

[59] TSX, *Policy Statement on Timely Disclosure* (December 2021) at 3.

[60] Ann Lipton, "Mixed Company: Audience for Sustainability Disclosures" (2018) 107 Georgetown Law Review 81.

Canada, as both require full, true and plain disclosures of material facts.[61] The *Securities Acts* and *Securities and Exchange Commission Acts* in the United States mandate disclosures of material facts, like their Canadian counterparts.[62] Disclosure is required if a reasonable investor would attach importance to whether they would purchase the security.[63]

Regulation S-K sub-part 1300 contains disclosure requirements for issuers in the United States.[64] Recent amendments to Regulation S-K aim to provide investors with a more comprehensive understanding of a registrant's mining properties, which should help them make more informed investment decisions.[65] The amendments closely align with international industry-based disclosure requirements and policies for mining properties and global regulatory practices and standards, as embodied by the *Committee for Reserves International Reporting Standards* ("CRIRSCO"), discussed below.[66] The Technical Report Summary is the SEC's equivalent of an NI 43-101 Technical Report with a format and content similar to NI 43-101.[67]

TMC is subject to United States and Canadian securities disclosure rules.[68] TMC has filed detailed US disclosure statements, including a comprehensive mineral resource estimate, as

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[61] Natalie Nowiski, "Rising above the Storm: Climate Risk Disclosure and its Current and Future Relevance to the Energy Sector" (2018) 39:1 Energy Law Journal 1 at 5.
[62] *Securities Act of 1933* 15 U.S.C. § 77a et seq., *Securities and Exchange Act, 1934*, 15 U.S.C. § 78a et seq. Pub.L. 73–291, 48 Stat. 881, June 6, 1934; s. 4.; *Securities Commission Act*, 15 U.S.C. §§ 77a-77aa 20, 15 U.S.C. §§ 78a-78pp.
[63] *Securities Act Rule* 405, 17 C.F.R. § 230.405; *Exchange Act Rule* 12b-2, 17 C.F.R. § 240.12b-2.
[64] *Regulation S-K*, *supra* note 39; *Regulation S-X*, *supra* note 33.
[65] *Ibid*.
[66] SEC, "Modernization of Property Disclosures for Mining Registrants: A Small Entity Compliance Guide" online: https://www.sec.gov/corpfin/secg-modernization-property-disclosures-mining-registrants#:~:text=A%20registrant%20must%20provide%20the%20disclosure%20specified%20in,Rule%20405%20or%20Exchange%20Act%20Rule%2012b-2.%20%5B2%5D.
[67] *Ibid*.
[68] AMC Consultants Pty Ltd, *supra* note 49; AMC, *Technical Report Summary: TOML Mineral Resource, Clarion Clipperton Zone, Pacific Ocean for DeepGreen Metals Inc.* filed In accordance with the requirements of SEC Regulation S-K (subpart 1300) AMC Project 321012 (26 March 2021); AMC, *Life of mine model based on Canadian NI 43-101 Compliant Preliminary Economic Assessment (PEA) for NORI-D Area (AMEC:* February 2021).

part of its initial public offering.[69] The United States Securities and Exchange Commission ("SEC") has had numerous issues with TMC's public filings, primarily financial and environmental. Many of these issues relate to the value TMC places on the minerals. Gaps noted by the SEC and TMCs' responses and actions to these SEC concerns put context in the need for a seabed mining valuation code.

4.3 Valuation Codes

Valuation codes represent an international best practice and prevailing consensus among representatives of government, industry, and financial institutions on the appropriate rules and protections for mineral assets, the environment, and payments to governments.[70] These best practices are subsequently incorporated into international policies and practices and mining jurisdictions' national (domestic) laws and regulations.[71] It is thus reasonable to conceptualize the best practices as a form of international soft law and domestic hard law.[72] Asset valuation codes are required under securities legislation for Canada and the United States (and several other jurisdictions). They form part of the prospectus and continuous disclosure obligations.

The purpose of valuation codes is to ensure complete, accurate, and consistent reporting of mineral information and estimates.[73] Valuation codes help investors make difficult investment decisions as smaller mining firms (such as TMC) have no cash flow or profit. The amount of minerals/ore believed to be in the ground) is often the sole asset to value a company or project. There is a real and substantial risk of undercapitalization of firms, and thus, a real

[69] SEC, "TMC/SOAC Prospectus Amendment No. 4 to Form S-4" File No. No. 333-255118 online: https://www.sec.gov/Archives/edgar/data/1798562/000121390021039153/fs42021a4_sustainableoppo.htm
[70] John Williams, "International Best Practice in Mining: Who Decides and How Does it Impact Law Development?" (2008) 39:4 Georgetown Journal of International Law 693.
[71] *Ibid*.
[72] *Ibid*.
[73] G Njowa, AN Clay & C Musingwini, "A perspective on global harmonisation of major national mineral asset valuation codes" (2014) 39 Resources policy 1–14.

potential that harms that arise from mining will go unrepaired if a company goes bankrupt.[74] Properly valuing a company and its assets is key to mitigating risk because a project should not be approved if the company cannot afford to mine.

4.3.1 Development

Efforts to standardize the disclosure of relevant information into a best practice for the minerals industry were first set in motion by introducing the *Joint Ore Reserves Committee's* ("*JORC") code* in 1989.[75] In 1994, the international mining community formed the Committee for Mineral Reserves International Reporting Standards ("CRIRSCO") under the Council of Mining and Metallurgical Institutes ("CMMI").[76] CMMI represents organizations and governments responsible for developing mineral reporting codes and guidelines in Australia, Brazil, Canada, Chile, Colombia, the European Union, India, Indonesia, Kazakhstan, Mongolia, Russia, South Africa, Turkey, and the United States.[77] The value of mining companies listed on the stock exchanges of these countries accounts for more than 88% of the mining industry.[78]

CRIRSCO facilitates a common foundation for estimating and reporting quantities and qualities of Mineral Resources and Mineral Reserves.[79] CRIRSCO's three fundamental principles that must be followed to conduct a mineral evaluation include competence,

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[74] Haselmann, Pistor & Vig, *supra* note 36.
[75] The *Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves* ('the JORC Code') is a professional code of practice that sets minimum standards for Public Reporting of minerals Exploration Results, Mineral Resources and Ore Reserves: see JORC, online: https://jorc.org/; Norman Miskelly, *Progress on International Standards for Reporting of Mineral Resources and Reserves* (Combined Reserves International Reporting Standards Committee, September 2003).
[76] CRIRSCO, "Background" online: https://www.crirsco.com/background/.
[77] CRIRSCO, "National Reporting Standards" online: https://www.crirsco.com/national/.
[78] CRIRSCO, Background, *supra note 76*.
[79] CRIRSCO, *International Reporting Template for the public reporting of Exploration Targets, Exploration Results, Mineral Resources and Mineral Reserves* (ICMM, 2019) at paras 5.2, 6.2.

materiality, and transparency.[80] CRIRSCO does not cover valuation or appraisal.[81] As stated in Chapter 6, the ISA uses CRIRSCO as its mechanism for mineral properties.

The *Canadian Code for the Valuation of Mineral Properties* ("CIMVAL") assists in valuing mineral properties (not corporations).[82] CIMVAL uses six fundamental valuation principles, including competence, materiality, reasonableness, transparency, independence, and objectivity.[83] CIMVAL is expressly incorporated into Canadian securities legislation. NI 43-101 - *Standards of Disclosure for Mineral Projects* regulates evaluation reports in Canada, while CIMVAL concerns valuation reporting.[84] The instrument is the principal regulatory document in Canada for the disclosure of scientific and technical information on mineral projects.[85] Thus, any trigger of disclosure in NI 43-101 must be accompanied by a comprehensive valuation report that is CIMVAL (or acceptable foreign code) compliant.[86] Acceptable foreign codes can be used in place of CIMVAL, including the JORC Code, the SAMREC/SAMVAL Code, and SEC Industry Guide 7 (now Regulation S-K subpart 1300), all of which are defined and detailed below.[87] CRIRSCO is not accepted as a valuation code.[88]

CIMVAL is part of an umbrella valuation standards group, the International Mineral Valuation Committee ("IMVAL").[89] IMVAL was formed in 2012 to harmonize mineral property valuations among various national codes and standards, including the CIMVAL Code.[90]

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[80] In addition to these fundamental principles, three other principles – Objectivity, Independence, and Reasonableness may also apply under national codes or standards. See CIMVAL and VALMIN, *infra*.
[81] Njowa & Musingwini, *supra* note 2; CRIRSCO, *supra* note 78 at s. 2.16.
[82] *CIMVAL*, *supra*, s. 1.1.
[83] *Ibid* at s 2.1.
[84] *Form 43-101F1 supra* note 35.
[85] *CIM Definition Standards for Mineral Resources & Mineral Reserves* (CIM Standing Committee on Reserve Definitions, 2014).
[86] *CIMVAL*, *supra* at s 2.11.
[87] *Form 43-101F1*, *supra*, s 1.1.
[88] *Ibid*.
[89] IMVAL, "Welcome to IMVAL," online: https://imval.org/.
[90] IMVAL, "History" online: https://imval.org/history. CRIRSCO describes mineral resources and reserves, while CIMVAL and IMVAL manage valuations.

IMVAL is an international committee comprised of representatives of SAMVAL (South Africa), CIMVAL (Canada), VALMIN (Australasia), the SME Valuation Standards Committee (USA), and IIMA (USA).[91] IMVAL's template attempts to partially harmonize international mineral valuation codes and standards for other countries that wish to develop their standards.[92] The template is principles-based to be recognized as a common set of minimum requirements for national codes or standards concerning valuing mineral assets and is updated from time to time.[93] IMVAL is not intended to be a stand-alone reporting code and does not supersede existing national reporting standards.[94]

The South African Code for the Reporting of Mineral Asset Valuation ("SAMVAL") was officially released in April 2008.[95] Abergel and Njowa argue that weaknesses in the SAMVAL limit its use as a terrestrial mining comparator.[96] For example, a valuator is not required to be independent of the commissioning entity and may have a conflict of interest in the subject property.[97] Thus, the valuation could be skewed to favour the valuator, not other investors or governments. Second, the code's competency requirement lacks a quantitative standard of experience.[98] The three principles (materiality, transparency, and competency) lack specific criteria for the valuator or commissioning entity to demonstrate compliance.[99] The code is not suited for corporate valuations.[100] This could greatly skew a market capitalization to be greater

[91] *International Mineral Property Valuation Standards Template 4th Ed.*, (IMVAL, 2021), s 1.2.
[92] *Ibid.*
[93] *Ibid* at s 1.1.
[94] *Ibid* at s 1.3.
[95] SAMVAL, *The South African Code for the Reporting of Mineral Asset Valuation* (SAMVAL, 2016).
[96] Keith Abergel, *Mineral Asset Valuation Codes: Towards an International Standard* (MASc, Queen's University, 2014) [unpublished].
[97] SAMVAL, *supra* note 95 at 24.
[98] Abergel, *supra* note 96.
[99] Njowa & Musingwini, *supra* note 2.
[100] Abergel, *supra* note 96.

than deserved and lower a company's risk.[101] The code's most serious shortfall is its poorly constructed definition of value, which precludes valuation methods that do not fall under the income approach (defined below).[102] As such, SAMVAL is not used in this dissertation.

The Australasian VALMIN Code, currently titled the *Australasian Code for Public Reporting of Technical Assessments and Valuations of Mineral Assets*, was adopted by The Australasian Institute of Mining and Metallurgy ("AusIMM") in February 1995.[103] VALMIN is a companion to the *Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves* ("JORC" Code).[104] The overriding principles of the VALMIN Code are materiality, competence, and transparency.[105] VALMIN has advantages and shortcomings. VALMIN has greater environmental and social protections than other valuation codes.[106] The VALMIN Code does not prescribe or list valuation methodologies.[107] Recently, the code was incorporated into Australian securities legislation.[108] VALMIN is used for environmental and social considerations, as described below, to inform the analysis in this dissertation.

The USA-based Society for Mining, Metallurgy, and Exploration, Inc. ("SME") published its first edition of the SME Valuation Standards in January 2016, and the USA-based International Institute of Mineral Appraisers has approved the adoption of a set of valuation standards based on the template.[109] The International Valuation Standards Council ("IVSC")

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[101] *Ibid*.
[102] Abergel, *supra*; Njowa, Clay & Musingwini, *supra*.
[103] Australian Institute of Geoscientists, "VALMIN" online: https://valmin.org/.
[104] *Australasian Code for Public Reporting of Technical Assessments of Mineral Assets* (the VALMIN Code) 2015 Edition (AusIMM, 2015).
[105] *Ibid* at Part 3.
[106] Njowa, Clay & Musingwini, *supra*; Njowa & Musingwini, *supra* note 2.
[107] VALMIN, *supra* note 103 at 12, 21.
[108] Australia, *Corporations Act* (1 July 2016), *ASX Listing Rules 2012;* ASX, "ASX Listing Rules" online: https://www2.asx.com.au/about/regulation/rules-guidance-notes-and-waivers/asx-listing-rules-guidance-notes-and-waivers#:~:text=%20%20%20%20Name%20%20%20,%20%2019KB%20%2017%20more%20rows%20.
[109] Resources and Reserves Committee of the Society for Mining, Metallurgy, and Exploration, Inc., *SME Guide for Reporting Exploration Information, Mineral Resources and Mineral Reserves* (SME, July 2017).

creates valuation standards for several financial instruments, including terrestrial mineral projects ("IVSs").[110] CIMVAL and the SME incorporate by reference the IVS standards.[111] TSX-listed companies' reserves and resources must conform to CIMVAL or SME.[112]

4.3.2 Reserves and Resources

The first step of valuation is to identify mineral resources and reserves. Mineral Resources are those materials that are potentially valuable and for which reasonable prospects exist for eventual economic extraction.[113] Mineral Reserves and Resources are important for legal and financial purposes.[114] CIMVAL defines a Mineral Resource as a concentration or occurrence of solid material of economic interest in or on the Earth's crust in such form, grade, quality, and quantity that there are reasonable prospects for eventual economic extraction.[115] The location, quantity, grade or quality, continuity and other geological characteristics of a Mineral Resource are known, estimated or interpreted from specific geological evidence or sampling.[116] Mineral Resources are subdivided into inferred, indicated, and measured, while Reserves include probable and proven in order of increasing geological and financial confidence.[117] In other words, reserves are more 'certain' than resources.

An Inferred Mineral Resource is the part of a Mineral Resource for which quantity, grade, or quality are estimated based on limited geological evidence and sampling.[118] Geological

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[110] *International Valuation Standards* (UK: International Valuation Standards Council, 2020); IVSC, "International Valuation Standards Council" online: https://www.ivsc.org/.
[111] *CIMVAL*, *supra* at s 1.8; *SME Standards and Guidelines for Valuation of Mineral Properties 2nd Ed* (SME, 2017) s 1.1.
[112] TSX *Company Manual - Disclosure Standards for Companies Engaged in Mineral Exploration, Development and Production*, Appendix B (TSX Group, 2006) , s 3.1.
[113] SME, *supra* note 111 at s 35.
[114] Abergel, *supra* note 96, Njowa & Musingwini, *supra* note 2; *NI 43-101*, *supra* note 35; Canadian Chamber of Commerce, *Mining capital: How Canada has transformed its resource endowment into a global competitive advantage* (Ottawa: Canadian Chamber of Commerce, 2013) at 14.
[115] *CIMVAL*, *supra* at 35.
[116] CIM, *supra*.
[117] CRIRSCO, *supra* note 76; IMVAL, *supra* note 85.
[118] CIM, *supra* note 79

evidence is sufficient to imply but not verify the grade or quality of ore. An Inferred Mineral Resource has a lower confidence level than an Indicated Mineral Resource and must not be converted to a Mineral Reserve.[119] It is expected that most Inferred Mineral Resources could be upgraded to Indicated Mineral Resources with continued exploration.[120]

An Indicated Mineral Resource is part of a Mineral Resource for which quantity, grade or quality are estimated with sufficient confidence to support mine planning and evaluation of the economic viability of the deposit.[121] Geological evidence is derived from detailed and reliable exploration, sampling and testing to determine the mineral grade or quality.[122] The evaluator must recognize the Indicated Mineral Resource category's importance to advance the project's feasibility. An Indicated Mineral Resource estimate is sufficient to support a Pre-Feasibility Study, which can serve as the basis for major development decisions.[123] An Indicated Mineral Resource may only be converted to a Probable Mineral Reserve.[124]

A Measured Mineral Resource is part of a Mineral Resource for which quantity, grade or quality, densities, shape, and physical characteristics are estimated with sufficient confidence to support detailed mine planning and final evaluation of the economic viability of the deposit.[125] A Measured Mineral Resource has a higher confidence level than an Indicated Mineral or Inferred Mineral Resource. It may be converted to a Proven or Probable Mineral Reserve.[126]

Mineral Reserves are those materials that can be legally, economically and technically extracted within the immediate future to generate earnings for the company.[127] In other words, a

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[119] ICMM, *CRIRSCO Standard Definitions*, (ICMM, October 2012).
[120] CRIRSCO, *supra* note 76; *CIMVAL*, *supra*.
[121] *Ibid*.
[122] *Ibid*.
[123] Abergel, *supra* note 96 at 11.
[124] *Ibid*.
[125] *Ibid; CRIRSCO Standard Definitions, supra note 119*.
[126] IMVAL, *supra* at s 7.11; CIM, *supra*.
[127] Njowa & Musingwini, *supra* note 2.

Mineral Reserve represents the probable or proven mineable share of a Measured and Indicated Mineral Resource. A Mineral Reserve considers all relevant metallurgical, economic, marketing, legal, environmental, social and governmental factors.[128]

Public disclosure of a Mineral Reserve must be demonstrated by a Pre-Feasibility Study or Feasibility Study.[129] Such studies demonstrate that extraction could reasonably be justified and must have reached the stage where the processing location is known.[130] It includes diluting materials and allowances for losses, which may occur when the material is mined or extracted and is defined by studies at a Pre-Feasibility or Feasibility level.[131]

Reserves are subdivided into Probable and Proven reserves. A Probable Mineral Reserve is the economically mineable part of an Indicated and Measured Mineral Resource.[132] A Proven or Proved Mineral Reserve is the economically mineable part of a Measured Mineral Resource. It implies a high degree of confidence in those elements and considerations used to convert Mineral Resources to Mineral Reserves.[133] These elements include, but are not restricted to, mining methods and financial provisions, processing technologies and locations, metallurgical content, infrastructure, marketing, legal, environmental, social and governmental factors.[134] Additional factors include legal matters, such as statutory and regulatory interpretations affecting the mine plan, environmental matters, accommodations the registrant commits or plans to provide to local individuals or groups connected with its mine plans, and governmental factors.[135] Mining registrants must disclose everything required under continuous disclosure

[128] CRIRSCO, *supra* at Part 8.
[129] SME, *supra* at 13; IVSC, *supra*; *CIMVAL*, *supra* at 2, 35.
[130] IMVAL, *supra* at Part 7; *CIMVAL*, *supra* at 35.
[131] *Ibid*.
[132] IMVAL, *supra*, s 8.7; *CIMVAL*, *supra* at 37.
[133] CIM, *supra*; *CIMVAL*, *supra*.
[134] CRIRSCO, *supra* at s 4.7.
[135] Regulation S-K, *supra*.

requirements (including CSA 51-333 and 51-358 detailed below) and the additional requirements in NI 43-101, Regulation S-K, CIMVAL and SME.

Since the regulations for exploitation do not yet exist for seabed mining, no reserve estimates are possible under the current valuation code definitions. For example, NI 43-101 mandates that an issuer must not disclose any deposits that have not been categorized as an inferred mineral resource, an indicated mineral resource, a measured mineral resource, a probable mineral reserve, a proven mineral reserve, or a gross value of the metals.[136] To accomplish this, an issuer must conduct an evaluation.

4.3.3 Evaluation

The process of identifying a mineral resource and reserve is called an evaluation. Evaluations include Feasibility Studies, Pre-Feasibility Studies and Preliminary Economic Assessments.[137] A Preliminary Economic Assessment ("PEA") is an early exploration study discovering ore or mineral deposits and includes an economic analysis of the potential viability of Mineral Resources.[138] Additional work to determine whether the quality and quantity of ore are viable to mine is not yet available, and progress to a Pre-Feasibility Study can be reasonably justified.[139] The concept study is a type of PEA that identifies the technical and economic parameters, including the target mineral reserve, the mining method, production targets, the processing method, potential target customers, and capital and operating costs.[140]

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[136] *NI 43-101*, *supra* at s 2.3.
[137] *CIMVAL*, *supra*, s 1.3.
[138] *NI 43-101*, *supra* at s 1.1.
[139] CRISCO Standard Definitions, *supra*.
[140] Matthieu Dussud & Gregory Kudar et al., *Optimizing mining feasibility studies* (*McKinsey and Co,* 2019); US regulation uses the term Initial Assessment; AMC, "*Feasibility studies for mining projects"* online: https://www.amcconsultants.com/experience/feasibility-studies-for-mining-projects#:~:text=Feasibility%20studies%20are%20required%20throughout%20the%20pre-production%20stage,economic%20knowledge%20gained%20at%20the%20various%20earlier%20stages; International Platinum Conference, *Establishing the feasibility of your proposed mining venture* (The South African Institute of Mining and Metallurgy, 2004).

A Canadian issuer cannot disclose the results of a PEA as part of its disclosure requirements unless it states with equal prominence that the PEA is preliminary and that it includes inferred mineral resources that are considered too speculative to have the economic considerations applied to them that would enable them to be categorized as mineral reserves.[141] The impact of the PEA affects the results of any pre-feasibility or feasibility study.[142] Applicant contractors cannot use historical studies as part of their disclosure requirements unless the disclosure states with equal prominence that a qualified person has not done sufficient work to classify the historical estimate as current mineral resources or mineral reserves and the issuer is not treating the historical estimate as current mineral resources or mineral reserves.[143]

A pre-feasibility study is a comprehensive study of a range of options for the technical and economic viability of a mineral project that has advanced to a stage where a preferred mining method is established, and an effective method of mineral processing is determined.[144] It includes a financial analysis based on reasonable assumptions and evaluation of other relevant factors sufficient for a valuator to determine if all or part of the Mineral Resource may be converted to a Mineral Reserve.[145] Mineral Reserve estimates must be supported by Pre-Feasibility or Feasibility studies that show their technical and economic viability.[146]

Feasibility studies are necessary to establish the presence of reserves.[147] A feasibility study is a comprehensive technical and economic study of the selected development option for a mineral project that includes appropriately detailed assessments together with any other relevant operational factors and detailed financial analysis necessary to demonstrate that extraction is

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[141] *NI 43-101*, *supra* at s 2.3(3).
[142] *Ibid*.
[143] *Ibid* at s 2.4.
[144] *Ibid* at s 1.4; CIM, *supra*; CRIRSCO, *supra* note 76.
[145] *Ibid*.
[146] CRIRSCO, *supra* at s. 4.6.
[147] Dussud & Gregory Kudar et al., *supra*; Seeger, *supra* note 3.

reasonably justified (economically mineable).[148] Feasibility is based on general assumptions and project input parameters of similar projects. Since there are no comparable seabed mining transactions, alternative assumptions must be formulated.[149] The technical and economic confidence of the Feasibility Study is equivalent to that required by a financial institution.[150] Projects are normally only commissioned after a feasibility study is finalized and reserves have been proved.[151] The feasibility study results may serve as the basis for a final decision by a proponent or financial institution to finance the project's development.[152]

For TSX-listed companies, feasibility studies (including pre-feasibility studies) are undertaken to determine whether a mineral deposit can be developed into a viable operating mine.[153] When a company discloses the results of a feasibility study, it must disclose the purpose and scope of the study and the conclusions.[154] Key parameters of the feasibility study must be disclosed, as in the case of the reporting of reserves.[155]

Previous to Regulation S-K, subpart 1300, the *US SME Industry Guide 7* required SEC staff to request a final feasibility study to support the disclosure of mineral reserves.[156] Recent amendments have lowered these requirements. For SEC reporting companies and those listed on US-based stock exchanges, a technical report summary required to support the determination and disclosure of mineral reserves in disclosure filings may be a pre-feasibility or a final feasibility

[148] CIM, *supra*; *CIMVAL*, *supra*; IMVAL, *supra*.
[149] Financing and costs from Solwara 1 are the closest comparators to seabed mining in the Area. However, this project never materialized due to financial and legal problems.
[150] CIM, *supra*.
[151] National Association of Certified Valuators and Analysts, *Mineral Asset Valuation and its uses, 2021 Webinar*, online: http://www.geologicalsociety.org.zw/sites/default/files/news-attachments/Mineral%20Asset%20Valuation%20and%20its%20Uses%20-%20Gambiza.pdf at 8.
[152] CIM, *supra*.
[153] TSX, *supra* at Appendix B and C.
[154] *Ibid*.
[155] *Ibid* at Appendix B, s. 4.1.
[156] *Industry Guide 7, Description of Property by Issuers Engaged or to be Engaged in Significant Mining Operations, Release No. FR-39 (30 July 1992) 57 Federal Register 36442, 17 CFR 229.801(g) and 229.802(g)*, by SEC.

study.[157] The rules now permit using a pre-feasibility study even in high-risk situations.[158] Under Industry Guide 7, a registrant could disclose non-reserve estimates, such as mineral resources, only in limited circumstances.[159] The rules require the inclusion of an analysis supporting the property's economic viability through a discounted cash flow analysis (explained below).[160]

There are significant differences between Regulation S-K and NI 43-101, most of which are beyond the scope of this dissertation.[161] Regulation S-K 1300 permits third-party firms to assume liability for a technical report summary.[162] The technical report must contain sufficient feasibility studies. If the US issuer is at the pre-feasibility stage, they must state that the tonnage, grade or quality of the target are conceptual, there has been an insufficient exploration of the property to estimate a mineral resource, and therefore, the target does not represent and should not be construed to be an estimate of a resource or reserve.[163] A valuator must include cautionary disclosures if there has been an insufficient exploration of the property to support an estimate of a mineral resource, uncertainty if further exploration will result in estimating a mineral resource, or if the exploration target does not represent, and should not be construed to be, an estimate of a mineral resource or reserve.[164] The SEC has taken issue with several of TMC's assumptions.

TMC stated that approximately 96% of the mineral resource within NORI Area D is classified as indicated, and a further 1% is classified as a measured resource. This forecast

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[157] *Modernization of Property Disclosures for Mining Registrants, Regulation S-K, subpart 1300, CFR Title 17 § 229.1300-130, (31 October 2018) effective as of 1 January 2021*.
[158] *Ibid* at 9.
[159] *Ibid*.
[160] *Ibid* at 175. The Discounted Cash Flow ("DCF") is detailed further below.
[161] *TMC*, "Prospectus Amendment No. 4", *supra* note 63.
[162] Mining Plus, *Securities and Exchange Commission´s S-K 1300 Guide* (13 February 2020) online: https://www.mining-plus.com/post/sk1300.
[163] *Ibid*.
[164] *Regulation S-K*, *supra* at §§ 229.1302, 229.1303 and 229.1304; SEC, *Modernization of Property Disclosures for Mining Registrants: A Small Entity Compliance Guide* (4 December 2018).

includes 6 Mt (wet) nodules classified as inferred mineral resources, approximately 2% of the total production.[165] The SEC commented:

> You report wet tons quantities and abundance, along with dry weight percentages for your respective metal analyses. Please clarify this mixed disclosure and include your estimated moisture content along with the overall resource recovery factors as a footnote to your resource estimates. Please disclose the method of calculation using your metal prices, mining/processing costs, and metallurgical recoveries.[166]

TMC responded that it had included a footnote to the mineral resources estimate that clarified the mixed disclosure and included the estimated moisture content along with the statement that estimates are presented on an undiluted basis without adjustment for resource recovery. In other words, all are *in situ* values.

4.4 Valuation

Valuation of mineral assets is a second step once Mineral Resources and Mineral Reserves have been quantified.[167] The objective of a valuation is most commonly to estimate what another entity might pay at a future date to acquire the mineral asset.[168] Valuation assists with capital raising (equity and debt), securities law disclosure requirements, litigation, income tax, royalty payments, investment decisions, and bank loan security.[169] A valuation applies to the first possible sale of any commodity and excludes properties and activities downstream from a smelter, refinery, or processing plant.[170] Thirty (30) years is the standard financial horizon used by banks and other financial institutions, as companies will be reluctant to invest more in exploration beyond thirty (30) year reserves.[171] The valuation of mineral assets at various stages of development is conducted using the applicable valuation methods (below). Investors

[165] AMC, *supra* at 157
[166] SEC, *Letter to SOAC re Amendment No. 3 Registration Statement on Form S-4 filed 14 July 2021* (26 July 2021).
[167] IVSC, *supra* at 9.
[168] Abergel, *supra* note 96 at 10.
[169] *Mineral Asset Valuation and its uses*, *supra* at 11.
[170] *CIMVAL*, *supra* at 36; CIM, *supra*; *Income Tax Act*, RSC, 1985, c 1 (5th Supp), s 125.1; *Regulation S-K*, *supra*; *Regulation S-X*, *supra* note 33.
[171] Rozemeijer et al, *supra* note 3.

generally use the Net Present Value ("NPV") method, where the estimated costs per unit of production are compared to expected revenues over the project's life, discounted by a rate of return based on the risk of the project.[172] The cost per unit of production depends upon accessibility (infrastructure), ore quality, input costs, taxes, and other metrics.[173] If the project is financially attractive, it has a positive NPV and exceeds a threshold rate of return, usually greater than 20%.[174] Economic analysis under CRIRSCO is not applicable at the exploration stage.[175]

A valuation report must address all material information.[176] Valuations must describe and discuss all material risks and limiting conditions that affect the analyses, opinions, and conclusions upon which the valuation is based.[177] Material risks include technical, operating, financial, socio-economic, environmental, permitting, marketing, commodity prices, foreign exchange, political and geopolitical risks, legal disputes, land claims, and other mineral exploration and development impediments.[178]

For example, TMC states that the NORI and TOML Contract Areas are currently its only material mineral properties after considering both quantitative and qualitative factors. The NORI Contract Area is the seafloor parcel where DeepGreen has performed the most resource definition and environmental work to date, including the establishment of measured, indicated and inferred mineral resources (defined and analyzed below) based on NORI's exploration activities as described in the NORI Technical Report Summary, dated March 2021, prepared by

[172] CRIRSCO, *supra* at 53, Table 1.
[173] Arianna Waye & Denise Young, "Sustainable Development and Mining—An Exploratory Examination of the Roles of Government and Industry" in Jeremy P Richards, ed, *Mining, Society, and a Sustainable World* (Springer International Publishing, 2009) at 164.
[174] Seeger, *supra* note 3.
[175] CRIRSCO, *supra* at 53; The ISA uses CRIRSCO at all stages of mining development and for valuation.
[176] *Regulation S-K*, *supra*; *NI 51-102*, *supra* note 32.
[177] *Regulation S-K*, *supra* at Items 903, 904; *CIMVAL*, *supra* at 2.1.2.
[178] *CIMVAL*, *supra* at 26; AMC Consultants Pty Ltd, *supra* note 49; *Regulation S-K*, *supra*.

AMC Consultants Ltd.[179] TMC believes the TOML is material because, as part of DeepGreen's acquisition of TOML in 2020, DeepGreen benefitted from existing environmental studies and resource definition included in a Canadian NI 43-101 compliant technical resource report with established measured, indicated and inferred mineral resources.[180] DeepGreen has not completed adequate research to establish the economic viability of any project in the Marawa Contract Area and is not currently a material property. The SEC takes issue with this, asking for clarification on which properties TMC considers material and the basis underlying this determination.[181]

Valuation is distinct from evaluation. Evaluation means assessing a Mineral Property's physical, technical, and legal aspects using the PEA, pre-feasibility or feasibility studies noted above.[182] Valuation estimates the monetary value of a Mineral Property (defined below) and can refer to the estimated value or the preparation of the estimated value (the act of valuing).[183] Securities laws disclosure regulations require both evaluation and valuation. As further illustrated in Chapter 6, the ISA requirements require only an evaluation.

Steps to valuation include establishing the property to be valued, defining the purpose of valuation, identifying the standard of value, identifying the appropriate valuation approach, calculating the discount rate, and incorporating the necessary valuation code requirements.[184]

4.4.1 Mineral Property

A Mineral Property includes the land, plus any patented and unpatented mining claims, prospecting permits, prospecting licences, exploration and exploration licences, development and

[179] TMC, *Preliminary Prospectus filed pursuant to US SEC Form S-1 under the Securities Act of 1933* (13 April 2022) at 103.
[180] *Ibid.*
[181] AMC Consultants, *supra* note 49; Regulation S-K, *supra* Item 102.
[182] Njowa & Musingwini, *supra* note 2 at 5; *CIMVAL*, *supra*; Abergel, *supra* note 96 at 34.
[183] *CIMVAL*, *supra*, s 1.3.
[184] *Ibid* at 12.

mining licences, leases, crown grants, and royalty interests.[185] The VALMIN Code defines mineral assets as "all property including but not limited to real property, intellectual property, mining and exploration tenements held or acquired in connection with the exploration of, the development of and the production from those tenements together with all plant, equipment and infrastructure owned or acquired for the development, extraction and processing of minerals in connection with those tenements."[186] In other words, it is more than just the land (or ore) being valued – licenses, permits and royalties are relevant to financial analysis.

A valuation code must describe the title and the owner's interest in the property, including surface rights, obligations that must be met to retain the property, the expiry dates of claims, licences, and other tenure rights with any encumbrances to the title.[187] Further, any applicable agreements, such as options, joint ventures, farm-ins, royalties, back-in rights, and other payments, must be valued and disclosed.[188] Statutory work requirements, surface rights, water rights, easements, aboriginal land claims, legal issues, environmental and permitting issues, and the impact on property development must also be disclosed and valued.[189] For properties at the exploration stage, additional comments are required on the availability of financing for exploration work.[190] VALMIN is more explicit. The Status of Tenure is material and requires disclosure. Determining the Status of Tenure should specify the tenure area, expiry and renewal dates, expenditure commitments, rents and rates, security bonds or reclamation liability, obligations to any third party, including, but not limited to, joint venture or royalty agreements,

[185] CIMVAL, *supra* at Part 4 - Definitions.
[186] VALMIN, *supra* at Part 14 - Definitions.
[187] *CIMVAL*, *supra* at 23; SME, *supra* at 32.
[188] *CIMVAL*, *supra*.
[189] *Ibid.*
[190] *CIMVAL*, *supra* at 28; AMC Consultants, *supra* note 49; *Regulation S-K*, *supra*.

and title and location of any contiguous and geologically related holdings.[191] In other words, royalties, taxes, and the regulatory regime directly flow into the valuation of a mineral property.

SEC staff had concerns about the governance of TMC and its affiliation with Nauru and the ISA.[192] Further, the SEC was concerned that financial projections to the ISA excluded taxes, duties, contractor costs for letters of credit, bank guarantees, and performance bonds, owners' costs, program management, cost of finance and project financing arrangements, cash flow, insurance, warranties, repairs, profit, and pre-project engineering and development Costs.[193] The SEC was also concerned about the relationship between TMC, Marawa and Kiribati. Specifically, they were concerned that TMC provided no financial or material disclosure information.[194] TMC asserted that the agreements with Marawa are not material contracts.[195] TMC stated that they have not completed adequate research to establish the economic viability of the Marawa contract area yet but put a value on these contracts in their marketing materials.[196]

4.4.2 Purpose

A comprehensive valuation report should consist of technical information and valuation analyses.[197] The technical information in a comprehensive valuation report should be at a similar level of detail as required in a Technical Report.[198] The TMC Technical Report for NORI D serves as their NI 43-101 and Regulation S-K subpart 1300 "compliant" reports.[199] Very little

[191] VALMIN, *supra* at 23.
[192] Regulation S-K, *supra* at Item 403.
[193] SOAC, *Letter to SEC Re Sustainable Opportunities Acquisition Corp. Registration Statement on Form S-4 Filed April 8, 2021* (26 May 2021) at 295.
[194] SEC, *Letter to Sustainable Opportunities Acquisition Corp. Re: Sustainable Opportunities Acquisition Corp. Amendment No. 3 to Registration Statement on Form S-4 Filed July 14, 2021* (July 28, 2021); Regulation S-K, *supra* note 39 at Item 601(b)(10).
[195] *Ibid*.
[196] SOAC, *Letter to SEC, filed April 8, 2021, supra note 187*.
[197] *CIMVAL*, *supra*, s 2.10.
[198] *NI 43-101*, *supra* at Form F-1.
[199] AMC Consultants, *supra* note 49.

valuation information is provided as they have not reached a stage where financials are sufficiently defined.

4.4.3 Standard of Value

Financial exposures may include creditors, expenditure and commitments on exploration tenures, costs of environmental regulatory requirements, rehabilitation and mine closure, and material agreements and contracts, including development plans, sales contracts, joint venture agreements, royalty agreements, project permits and environmental and access requirements.[200] Under VALMIN, capital costs will likely include feasibility and associated studies costs, acquisition costs, construction, implementation and commissioning costs, working capital, decommissioning rehabilitation and site restoration costs, and contingency allowances.[201] The codes state that when a property is at a feasibility study stage, the disclosure must summarize and describe any technical or financial issues that may impact the valuation and discuss measures to deal with these. This summary must include an outline of capital costs, operating costs, sustaining capital, closure costs, contracts, taxes, and royalties.[202]

TMC added that the TOML Exploration Contract is in development, defined by SK 1300 as a mineral property with reserves.[203] The SEC disagreed, stating that TMC is in the prefeasibility study phase, which may imply determined reserves. SEC required TMC to review its usage of terms and phases and modify to clarify that they are an exploration stage issuer with a completed initial assessment currently working towards a prefeasibility study.[204] TMC then

[200] VALMIN, *supra* at 31.
[201] *Ibid* at 26.
[202] *CIMVAL*, *supra*; AMEC, *Capital Cost Estimating for Mineral Processing Plants* (University of British Columbia, 2018).
[203] The Metals Company/SOAC, *Investor Presentation* (9 September 2021) at 25
[204] SEC, *Letter to SOAC Re: SOAC Amendment No. 1 Registration Statement* on Form S-4 Filed May 27, 2021 File No. 333-255118 at 2; Scott Leonard, *Letter to SEC Re: SOAC Amendment No. 1 Registration Statement* on Form S-4 Filed May 27, 2021 (16 June 2021).

revised its disclosure to clarify that the TOML property is in the exploration stage, not the development stage and that DeepGreen is an exploration stage issuer with a completed initial assessment currently working towards a prefeasibility study. TMC noted that Mineral Resources were first estimated for NORI by Golder Associates in late 2012, primarily using data collected by the Pioneer Investors in the 1980s.[205] The data used by AMC in 2019 was also solely based on Golder's estimates, which explain the mineral abundance.[206] NORI only recently commenced a pre-feasibility study to analyze the technical and economic viability of the collection system and metallurgical process and verified capital and operating costs to greater accuracy.[207] The report requires this work before financial metrics can be contemplated, which will require seven years to conduct baseline studies, while the base environmental assessment itself may require an additional three years.[208] NORI only expects that the findings from the scoping study will be published in the scientific literature by 2023.[209]

The SEC has also taken issue with the precision of TMC's forecasts. DeepGreen contracted a cost estimate study in the mid-2010s. The result was considered a class 4 study, which means that offshore capital costs were estimated at -30% +40% accuracy, while onshore capital cost estimate was developed according to a class 5 level of accuracy (–35% +50%).[210] What makes these estimates less reliable is the date of studies. The SEC notes:

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[205] Golder Associates, *NI 43-101 Technical Report; Clarion-Clipperton Zone Project, Pacific Ocean Report by Golder Associates Pty Ltd* (Golder, 2013); Golder, *Preliminary Economic Assessment, NORI Clarion-Clipperton Zone Area D Project, Pacific Ocean* (Golder, 2015).
[206] AMC, *supra* at 132.
[207] DeepGreen, *NI 43-101 Technical Report for the NORI Clarion – Clipperton Zone Project*, (Golder, 2018) at 102; AMC, *supra* at 134.
[208] DeepGreen, *supra* at 105; AMC *supra* at 149.
[209] Chile, *Letter dated 16 June 2022 from the Permanent Mission of Chile to the United Nations online:* https://www.un.org/Depts/los/meeting_states_parties/documents/Splos3215ChilePositionPaperAdvanceVersion.pdf; Georgina Guillen Grillo, *Letter from Costa Rica to the International Seabed Authority*, online: https://int.nyt.com/data/documenttools/2022-11-costa-rica-permanent-representative-to-isa-georgina-guillen-grillo-statement/8bc4fa95bea26199/full.pdf.
[210] TMC, Prospectus *supra*.

> Capital and operating cost estimates in an initial assessment must have an accuracy level of at least plus or minus 50% and a contingency level of no greater that 25% pursuant to Item 1302(d)(4)(i) of Regulation S-K. Please revise to include the accuracy level and contingency level of your initial assessment.[211]

TMC added that the variables with the biggest negative impact on its value were metal prices, operating costs, and capital costs. TMC reversed course and added that the valuator cautions that a prefeasibility study has not been undertaken. The seafloor production schedule is preliminary and should not be interpreted as a mineral reserve. The SEC was unconvinced:

> Please revise this risk factor to highlight that DeepGreen's valuation was based on projected EBITDA in 2027 which was substantively derived from an initial assessment which contained various assumptions and limitations. These risks could include the absence of due diligence conducted by an underwriter that would be subject to liability for any material misstatements or omissions in a registration statement.[212]

TMC revised its disclosure to include the assumptions underlying the projections for the accuracy and contingency levels and the assumption that the date of the decision to mine on the NORI Contract Area is expected to be on or around 30 June 2023.[213]

4.4.4 Valuation Approach

There are three approaches, and each valuation is time and circumstance-specific. The most appropriate valuation approach will depend on several factors, including the stage of development, the highest and best use, the Basis of Value, the availability of valuation inputs and data, and the approaches used by the market.[214] The more advanced the project, the better the financial statements are. Different types of investors prefer different stages. Earlier stages are riskier and often use venture capital levels of financing. Under VALMIN, Valuation Methods include but are not limited to comparable sales transactions and joint venture terms.[215]

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[211] SEC, *supra* at 2-3; Regulation S-K, *supra* at Item 1302(d); AMC *supra* at 153.
[212] SEC, *Letter to SOAC re Amendment No. 3 Registration Statement* on Form S-4 filed July 2021 (26 July 2021) at 4.
[213] SOAC, *Letter to SEC Re: Sustainable Opportunities Acquisition Corp. Amendment No. 3* to Registration Statement on Form S-4 Filed July 14, 2021 (28 July 2021); NY Times, "Battle Over Deep-Sea Mining Takes on New Urgency as Trial Run Winds Down" (3 November 2022) online https://www.nytimes.com/2022/11/03/world/deep-sea-mining.html.
[214] IVSC, *supra* at IVS 104; *CIMVAL*, *supra* at s. 2.6.
[215] *Ibid* at 28.

The Basis of Value is a statement of the fundamental measurement assumptions of a valuation and is most commonly referred to as Market Value.[216] The Market Value is the estimated amount for which an asset or liability should be exchanged between a willing buyer and a willing seller in an arm's length transaction.[217] The Market Value of a Mineral Property must be estimated considering its highest and best use based on its stage of development, which is the best use that is legally permissible, physically possible, financially feasible and maximizes its potential.[218] The highest and best use for a Mineral Property is the use that a market participant would have in mind when formulating the maximum price it would be willing to offer.[219] The Basis of Value can include Fair Value. Fair Value is the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date.[220] Differences stem from valuation fundamentals:

(a) Value relates to a specific point in time,
(b) Value relates to current and future expectations of cash flows,
(c) The value of an asset is based on, or related to, what the asset can or could earn,
(d) Hindsight, in general, must not be used in reaching valuation conclusions,
(e) The market dictates the required rate of return (known as the discount rate).[221]

The three accepted valuation approaches are income, market, and cost.[222] For Mineral Properties with Mineral Reserves, the income approach is usually the most appropriate and the cost approach the least appropriate. [223] Valuation methods from at least two of the three Valuation Approaches should be used for a particular Mineral Property.[224] Gross "*in situ*" Metal Value is not an acceptable valuation method in the TSX Manual, the CIMVAL, or the

[216] IVSC, *supra*; *International Valuation Standards, IVS Definitions and Framework, (31 January 2020)*.
[217] IVSC, *supra* at s. 29; *Income Tax Act*, *supra* at ss. 35, 65(1), 125.1.
[218] Ibid at paras 140-149.
[219] *Ibid*.
[220] *Ibid* at IVS 300 at G1, ss. 36, 43.
[221] *Ibid* at 20; *CIMVAL*, *supra*, s 3.2.
[222] IVSC, *supra* at IVS 105.
[223] *CIMVAL*, *supra* at Table 2.
[224] IVSC, *International Valuation Standards, IVS Definitions and Framework* (31 January 2020) at ss 19 and 20.

VALMIN.[225] *In situ* values greatly overestimate the amount of ore that is minable.[226] As discussed in the next chapter, the ISA allows *in situ* valuations.

4.4.4.1 Income Approach

The income approach indicates value by converting future cash flows to a single current capital value.[227] The principle of anticipation of benefits underlies the income approach, as the property almost certainly will yield income in the future, and the value of those future incomes are not equal to those that can be realized today unless an operator is working under a zero discount rate. The value may be determined using a discounted cash flow method.[228] A discounted cash flow ("DCF") model time and risk-based discounts are applied to the revenue and expenditure streams. The terms of a financial instrument typically set out:

> (a) the timing of the cash flows, i.e., when the entity expects to realize the cash flows related to the instrument,
> (b) the calculation of the cash flows, e.g., for a debt instrument, the interest rate that applies
> (c) the timing and conditions for any options in the contract, e.g., put or call, prepayment, extension, or conversion options, and
> (d) protection of the parties' rights to the instrument, e.g., terms relating to credit risk in debt instruments or the priority over, or subordination to, other instruments held.[229]

It is unacceptable to use mineralization categories (such as potential quantity and grade, potential resource, exploration potential, exploration target, potential deposit, or target for further exploration) that do not conform to the definitions of Mineral Reserves and Mineral Resources.[230] It is generally only acceptable to use Mineral Resources if Mineral Reserves are present, as insufficient information makes resource estimates invalid. Items not Mineral Reserves or Mineral Resources must have explicit disclaimers that their valuations cannot be relied

[225] TSX, *supra* at s. 3.2; *CIMVAL*, *supra*; VALMIN, *supra*.
[226] *Ibid*.
[227] IVSC, *IVS 105 Valuation Approaches and Methods* (4 April 2016) at Section 40.
[228] *CIMVAL*, *supra* at Table 2; *Regulation S-K*, *supra* at 149.
[229] IVSC, *supra* at 118.
[230] *CIMVAL*, *supra* , s 3.4.3.

upon.[231] Where technical, economic, and other relevant parameters are at a lower confidence level than the pre-feasibility study level (for example, a PEA), it is recommended that the higher risk or uncertainty be recognized by some means, which might include using a higher discount rate, reducing the quantum of the Mineral Resources, probability weighting the resource quality, applying sensitivities to the assumptions, or delaying the timing of the production of the Mineral Resources in the income approach model.[232] The valuation report must contain a qualifying statement about the confidence level of the technical, economic, and other relevant parameters relative to a Pre-Feasibility Study or a Feasibility Study confidence level.[233] For example, where Inferred Mineral Resources are used, it is recommended that the reason for using them be explained and that the higher risk or uncertainty be recognized by some means, which might include using a higher discount rate, reducing the quantum of the Mineral Resources, probability weighting the resource quality, applying sensitivities to the assumptions, or delaying the timing of the production of the Inferred Mineral Resources in the Income Approach model.[234] Inferred Mineral Resources should be used with great caution and care, particularly where Inferred Mineral Resources account for all or a dominant part of total Mineral Resources. The valuator should consider other valuation techniques that may be more appropriate.[235] The TMC report is significantly based on inferred resources yet attempts to use an income method to value the property using gross *in situ* values.[236]

If the valuer finds obtaining sufficiently accurate or reliable data impossible or impractical, this must be stated in the valuation report.[237] Alternatively, the valuer may make

[231] *Ibid*.
[232] *Ibid* at s 3.4.4.
[233] *Ibid* at s. 3.4.4(e).
[234] *Ibid* at s. 3.4.4(f)
[235] *Ibid*.
[236] TMC has an offtake agreement which provides some estimates of cash flow certainty.
[237] IVSC, *supra*.

one or more assumptions, which must be disclosed prominently.[238] All valuations must explain how the valuer derived the discount rate used for the income approach.[239]

4.4.4.2 Market Approach

The market approach indicates value by comparing the asset with identical or comparable (similar) assets for which price information is available.[240] The market approach is also known as the sales comparison approach.[241] Methods include comparable transactions, market capitalization analysis, and option or farm-in agreement terms analysis.[242] Using an exchange-based price is the easiest way to compare mineral sales. A price obtained from trading on a liquid exchange on, or close to, the time or date of valuation is normally the best indication of the market value.[243] The valuator would calculate cash inflow based on the historical selling price of the mineral. In cases with no recent relevant transactions, the evidence of quoted, consensus prices, or private transactions may also be relevant.[244] Since the grade and quantity of mineral reserves are always uncertain, a characteristic known as reserve risk makes it difficult to determine the value of the mineral asset.[245]

Using the market value of future commodity prices may produce a more accurate result.[246] Such information includes prices from recent transactions in the same or a similar instrument, quotes from brokers or pricing services, credit ratings, yields, volatility, indices or

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[238] *CIMVAL*, *supra* at 39.
[239] Described below. The discount rates do not normally account for environmental and social factors. I will explore environmental and social discounts in later chapters.
[240] IVSC, *IVS 105 Valuation Approaches and Methods*, (4 April 2016) at s. 20.1.
[241] *Ibid*; *CIMVAL*, *supra* at 34.
[242] *Ibid*.
[243] *Ibid*.
[244] Seeger, *supra* note 3; Jeremy Richards, *Mining, Society, and a Sustainable World* (Heidelberg, 2009); CIM, *supra* note 79.
[245] Njowa & Musingwini, *supra* note 2.
[246] Xiao, Florescu & Zhou, *supra* note 4 at 3.

any other inputs relevant to the valuation process.[247] A price adjustment is necessary if the observed instrument is dissimilar to another project or ore being valued or if the information is not recent enough to be relevant.[248] A polymetallic nodule is a unique type of ore, and a valuator cannot simply sum the estimated values of the included minerals. As shown in Chapter 6, manganese in nodules may have a higher phosphorus content and be unsuitable for steelmaking.

4.4.4.3 Cost Approach

The cost approach uses the principle of contribution to value.[249] The appraised value method is commonly used where exploration expenditures are analyzed for their contribution to the exploration potential and may be adjusted for market conditions.[250] The cost approach uses the principle that a buyer will pay no more for an asset than the cost to obtain an asset of equal utility, whether by purchase or construction and includes methods based on expenditures.[251]

The cost approach should only be used in narrow circumstances. Cost may be used when participants can recreate an asset with substantially the same utility as the subject without regulatory or legal restrictions (a 'replacement cost or value method'). [252] Cost may also be utilized where the asset is not directly income-generating or when the unique nature of the asset makes using an income or market approach unfeasible (the replica method).[253] The replacement cost method is untenable for seabed mining because there is no similar asset. As shown in Chapter 6 and explained below, seabed mining firms attempt to sum the costs and values of nickel, manganese, and lithium, based on inferred resources in the gross *in situ* state.

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[247] Njowa & Musingwini, *supra* note 2.
[248] IVSC, *supra* s 50.
[249] *CIMVAL*, *supra*.
[250] IVSC, *supra*, s 60.
[251] IVSC, *IVS 105 supra* at Section 60.
[252] *Ibid* at s 60.2.
[253] *Ibid* at s 70.

4.4.4.4 Additional Valuation Requirements

For firms listed on the TSX, there are additional valuation constraints. The TSX exchange manual requires a CIMVAL-compliant valuation of a mineral property to be prepared to support the issuance of securities in the case of an acquisition, disposition, or change of control transaction.[254] A valuation prepared in conformity with Appendix 3G is distinct from a CIMVAL compliant valuation. Appendix 3G categorizes mineral properties into two types: properties with mineral reserves and properties without mineral reserves.[255] Appendix 3G removes the valuators' discretion by prescribing the primary valuation methods for the property type.[256] A discounted cash flow analysis using the income approach must be used for properties with mineral reserves.[257] Mineral resources cannot be included in any cash flow model, and the estimate must be supported by " a current and relevant prefeasibility study."[258]

The SEC also modifies CRIRISCO's allowance of *in situ* values. The SEC replaced the requirement to present mineral reserve disclosure as net of diluting materials and allowances for losses that may occur when the mineral resource is mined or extracted with the requirement to disclose reserves as including such diluting materials and allowances for losses.[259] The SEC has taken issue with TMC's use of *in situ* calculations.[260]

> Polymetallic resources and reserves must not be expressed in terms of metal equivalents except in the limited circumstances as set out in NI 43-101, F1, 19(k) and the CIM Standards on Mineral Resources and Reserves. It is also inappropriate to refer to the gross value or *in situ* value of resources and reserves. Ascribing gross values to resources and reserves remaining in the ground without disclosing potential capital and operating costs and other economic factors is meaningless and potentially misleading.[261]

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[254] TSX, *supra* at Appendix 3G.
[255] *Ibid* at Appendix 3G, s. 4.
[256] *Ibid*.
[257] *Ibid*.
[258] *Ibid*.
[259] *Regulation S-K*, *supra* at 34.
[260] SEC, *Letter to SOAC supra note 196* at 3; *Regulation S-K*, *supra* at Item 1303(b)(3)(v).
[261] SOAC, *supra* at 120.

TMC revised each mineral resource estimate to state that such mineral resource estimates are "*in situ*."[262] Further, the SEC has taken issue with TMC's cash flow assumptions:

> We note your cash flow analysis includes inferred resources which amount to approximately 2% of your total production. Item 1302(d)(4)(ii)(C) of Regulation S-K requires disclosure, with equal prominence, of the results of the economic analysis excluding inferred resources in addition to the results that include inferred resources. In the event there is not a significant difference, make a statement to that effect.[263]

TMC amended its disclosure and now states with equal prominence the cash flow analysis results of the economic analysis, excluding the inferred mineral resources.

4.4.5 Rate of Return and Risk

Once the valuation method is selected, a valuer must analyze the risk of a project. Risk is essential to valuing a financial instrument, project, and applicant. A discounted cash flow analysis uses certain factors called discount rates as proxies. More simply, discount rates vary with the level of uncertainty, hence the risk in future events. A discount rate must reflect the risks and be consistent with the cash flows.[264] The higher the risk, the higher the discount rate, the lower the return. Determining the opportunity cost of capital used as the proper discount rate in a mining project is difficult.[265] In establishing the appropriate discount rate, it is necessary to assess the return that would be required to compensate for the time value of money and potential risks, the terms and conditions of the mining contract, credit and counterparty risk, the liquidity

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[262] *Ibid*. See also TMC, "Investor Presentation – Q4 2021" online: https://int.nyt.com/data/documenttools/tmc-q4-2021-update-presentation-3-24/957072afe5124068/full.pdf#page=4 at 4; TMC, "Solving availability: *in situ* resource sufficient to electrify the entire U.S. car fleet" Investor Presentation, online: https://metalsco.canto.com/pdfviewer/viewer/viewer.html?v=InvestorVideos&portalType=v%2FInvestorVideos&column=document&id=84o4914u417bh39qnj8qbnrq67&suffix=pdf&from=landingpage#page=25 at 13.

[263] SEC, *supra* at 4; *Regulation S-K* Item 1302(d)(4)(ii)(C).

[264] A Ardian & M Kumral, "Dynamic discount rate through Ornstein-Uhlenbeck process for mining project valuation" (2018) 212:1 Earth Environ Sci 12058; Frédéric Cherbonnier & Christian Gollier, "Risk-adjusted Social Discount Rates" (2022) 43:4 The Energy journal (Cambridge, Mass); Eric Lilford, Bryan Maybee & Dan Packey, "Cost of capital and discount rates in cash flow valuations for resources projects" (2018) 59 Resources policy 525–531.

[265] Thomas F. Torries, "Choosing the Discount Rate: A Fairy Tale" Paper presented to the 2000 SME Annual Meeting and Exhibit (West Virginia University, 2000) online: https://www.mineralsappraisers.org/uploads/document/8WR4BBQYY9-20170116-064504.pdf at 4.

and marketability of the asset, the risk of changes to the regulatory or legal environment, and the tax status.[266] Other factors are operating costs, sustaining capital, transportation costs, refining and processing, closure costs, contracts, taxes, royalties, commodity prices, and foreign exchange rates.[267] Other risks include constraints to further success, such as legal disputes, land claims, permitting constraints, or physical impediments to effective exploration.[268]

The SEC seemed to have concerns with TMC's filings about risk:

> Please revise this risk factor to highlight that DeepGreen's valuation was based on projected EBITDA in 2027 which was substantively derived from an initial assessment which contained various assumptions and limitations. Additionally, please disclose here or in a new risk factor the material risks to unaffiliated investors presented by taking DeepGreen public through a merger rather than an underwritten offering. These risks could include the absence of due diligence conducted by an underwriter that would be subject to liability for any material misstatements or omissions in a registration statement. Please disclose the financial projections provided by DeepGreen, including qualitative and quantitative disclosure of the material assumptions underlying these financial projections.[269]

TMC revised DeepGreen's financial projections for the years 2021 through 2027. The SEC, however, requested revisions to this data:

> Please revise to discuss the qualified person's opinion on whether all issues relating to relevant technical and economic factors likely to influence the prospect of economic extraction can be resolved with further work as required by Item 601 paragraph (96)(iii)(b)(11)(vii) of Regulation S-K.[270]

TMC advised the SEC that AMC has revised the disclosures in the revised NORI Technical Report Summary to include the Qualified Person's opinion that all issues relating to all relevant technical and economic factors likely to influence the prospect of economic extraction can be resolved with further work. The limiting factor for Mineral Resource classification for

[266] IVSC, *supra* note 104 at s 60.2; Lilford, Maybee & Packey, *supra* note 258; Ardian & Kumral, *supra*; Roland Cormier & Jemma Londsdale, "Risk assessment for deep sea mining: An overview of risk" (2020) 114 Marine policy 103485.
[267] Richards, *supra* note 238; Abergel, *supra* note 96.
[268] Buchholz et al, *supra* note 25; Waye & Young, *supra*; Richards, *supra*; Abergel, *supra* note 96; *CIMVAL*, *supra* .
[269] SEC, *Letter to SOAC Sustainable Opportunities Acquisition Corp. Registration Statement on Form S-4 Filed April 8, 2021* (5 May 2021).
[270] SEC, *Letter to TMC re Post-Effective Amendment No.1 to Registration Statement* on Form S-1 Filed April 14, 2022 (10 May 2022).

NORI Area D is confidence in the estimates for abundance.[271] The Measured Mineral Resource was assigned to the Area within NORI Area D, where sampling was conducted on a nominal 7 km by 7 km. The Indicated Mineral Resource was conducted on a nominal spacing of 7 km by 7 km but without additional photo-estimates of nodule abundance or 10 km by 10 km.[272] The Inferred Mineral Resource was assigned to areas that are unsampled.[273] TMC then claimed:

> Accordingly, NORI Areas A, B and C have sufficient continuity to warrant Inferred Mineral Resource classification following SEC Regulation S-K (subpart 1300). It is reasonable to expect that, with further engineering design and test work, the technical and economic factors relevant to the collection of nodules and the extraction of nickel, cobalt, copper and manganese products from the nodules can be resolved.[274]

4.4.6 Offtake Agreement and Pricing Certainty

Offtake agreements (which include stream financing) are arrangements between a producer and a buyer to purchase or sell portions of the producer's yet-to-be-manufactured goods.[275] In addition to providing a guaranteed market and source of revenue for its product, an offtake agreement allows the producer to guarantee a minimum profit level for its investment.[276] Since offtake agreements often help secure funds for the creation or expansion of a facility, the seller can negotiate a price that secures a minimum return on the associated goods, lowering the risk associated with the investment.[277] This agreement should provide some price certainty for valuation. The downside of these financing techniques is that miners sell their production forward at a discount to current commodity prices, forfeiting any upward pricing in the

[271] TMC, *Amendment No. 1 to Post-Effective Form S-1: Registration Statement Under the Securities Act of 1933* (31 May 2022) at 161.
[272] *Ibid* at 162.
[273] *Ibid*.
[274] *Ibid* at 176.
[275] Will Kenton & Troy Segal, "Offtake Agreements: What They Mean, and How They Work" online: *Investopedia* https://www.investopedia.com/terms/o/offtake-agreement.asp.
[276] Buchholz et al, *supra* note 25.
[277] Christopher A McHugh, "Mobilising Private Funding of Development Finance" (2021) 57:12 The Journal of development studies 1979.

commodity cycle.[278] Another downside is that novel types of financing are being used but are not factored in by the ISA in developing a royalty regime.[279]

In March 2022, NORI and Allseas agreed that Allseas would upgrade the pilot nodule collection system to a commercial system with a targeted production capacity of 1.3 million tonnes of wet nodules per year by 2024.[280] DeepGreen and Allseas entered into a nodule collection and shipping agreement whereby Allseas will provide production services for producing the first 200 million metric tonnes of polymetallic nodules. Allseas will receive the right to collect the first 100 million metric tonnes (wet) of manganese nodule resources by paying DeepGreen a royalty equivalent to 50% of the royalty charged by the ISA on the nodules collected. Further, TMC signed copper and nickel offtake agreements with Glencore International AG.[281] Glencore will purchase fifty percent (50%) of the annual quantity of copper and nickel produced from nodules derived from the NORI Area at market pricing with allowances for product quality.[282] In other words, not *in situ*.

4.5 Securities and Valuation Code Environmental and Social Considerations

4.5.1 Canada

Terrestrial mining has positively and negatively impacted the social, equity and policy issues in developing (and developed) states. Five material disclosure requirements are relevant under CSA Staff Notices 51-333 and 51-358.[283] These include environmental risks, trends and uncertainties, liabilities, asset retirement obligations, and financial and operational effects of environmental protection requirements.[284] Environmental risks are broken into five categories:

[278] Seeger, *supra* note 3 at 11, 34.
[279] DeepGreen, *supra* note 103.
[280] This contrasts with their public filings that they will mine 1.7 million tonnes per annum.
[281] DeepGreen , *supra* note 103; Golder Associates, *supra* at 4.
[282] *Ibid*.
[283] *Environmental Reporting Guidance*, CSA Staff Notice 51-333 (27 October 2010).
[284] *Ibid* at 8.

litigation, physical, regulatory, reputation and business model.[285] Physical risks are risks to physical assets, often related to the impacts of climate change.[286] The issue will be material if the issuer is likely to be affected by physical risks of environmental matters, such as the impacts of industrial contamination, changing weather patterns and water availability. Environmental impacts include property damage, health and safety issues, disruptions to operations, disruptions to the transport of products, increased insurance claims and liabilities for insurance and reinsurance issuers, and increased insurance premiums and deductibles, to name a few.[287] [288]

Regulatory risk is a risk of changes in the regulatory environment affecting the sector in question, including how it may be taxed or subsidized.[289] Regulations may include environmental permits, reporting requirements, carbon pricing systems, carbon limits and trading systems, energy efficiency standards and building codes. They can include both applicable domestic and foreign requirements. The issuer should consider specific risks due to environmental legislation or regulation and avoid generic risk factor disclosure.[290] Changes to royalty systems would be included as regulatory risk.

Reputational risk is the potential change in public perception, manifesting as public campaigns, boycotts or purchasing decisions. This risk discloses the impact on the issuer's results and operations arising from its interaction on environmental matters with local

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[285] *Ibid* at 9–10.
[286] UNEP FI, *Diving Deep: Finance, Ocean Pollution and Coastal Resilience* (Geneva: UNEP, 2022).
[287] 51-333, *supra*.
[288] At the time of writing, the CSA has proposed a new national instrument for climate related disclosures. See OSC, *Consultation Climate-related Disclosure Update and CSA Notice and Request for Comment Proposed National Instrument 51-107 Disclosure of Climate-related Matters online: https://www.osc.ca/en/securities-law/instruments-rules-policies/5/51-107/51-107-consultation-climate-related-disclosure-update-and-csa-notice-and-request-comment-proposed;* Keith MacMaster and Amanda Chiong, *Re: Comments on Proposed National Instrument 51-107 Disclosure of Climate-related Matters and companion policy* (13 January 2022) online: https://www.osc.ca/sites/default/files/2022-01/com_20220113_51-107_macmasterk.pdf.
[289] *Ibid*.
[290] 51-333, *supra*.

communities.[291] The negative stigma on seabed mining may negatively impact contractors and operators delivering goods mined from the seafloor. For example, material negative stigma could influence the share prices of seabed mining operators.

Operational risks include the potential interruption of ongoing activities, including supply chain operations. There are also possible indirect consequences or opportunities. These may include changes to production practices, changes due to emerging technologies, decreased demand for goods that harm the environment or fail to meet customer standards, increased demand for goods that have less of an impact on the environment than competing products, changes to tax incentives and subsidies, and increased competition to develop innovative products. Further, there may be an increased demand for the generation and transmission of energy from alternative energy sources and decreased demand for services related to carbon-based energy sources, such as drilling services or equipment maintenance services, logistics and other disruption of business operations to waste collection due to strikes.[292] Litigation risk asks whether the issuer could be a party to any environmental litigation and, if so, their anticipated liability exposure.[293] These environmental issues must be disclosed.[294]

CIMVAL's environmental provisions include discussing available information on environmental, permitting, and social factors, describing the environmental standards that must be met and the permits needed to continue work on the Mineral Property, their application status, and any limitations they may impose on the property's exploration, development, and production. Additionally, a contractor must summarize the results of any environmental studies and discuss

[291] *Ibid*; UNEP FI, *supra*; *Regulation S-K*, *supra*.
[292] 51-333, *supra* at 7.
[293] *Ibid*.
[294] *Ibid* at 8; *Annual Information Forms*, BCSC Form 51-102F2 (30 June 2015); OSC, "Continuous Disclosures" online: http://www.osc.gov.on.ca/en/Companies_continuous-disclosure_index.htm; Thompson Reuters, "Annual Information Form (AIF)" online: https://ca.practicallaw.thomsonreuters.com/0-570-0162?transitionType=Default&contextData=(sc.Default)&firstPage=true&bhcp=1; 51-107 *supra* note 285.

any known environmental issues that could materially impact the ability to establish mining operations on the Mineral Property and plans to mitigate them, discussing any potential social requirements and plans for the Mineral Property and the status of any negotiations or agreements with local communities, and describing plans for bonding, pre-closure remediation, reclamation, closure plan, and post-closure responsibilities.[295]

Technical, economic, social and environmental parameters for any CIMVAL valuation include but are not limited to Mineral Reserves, Mineral Resources, mining recovery, mining dilution, mining plan, tailings and waste management, production schedules, metallurgical test work, metallurgical recovery, process plant design, project engineering, construction schedule, environmental aspects, permitting, socio-economic aspects, political and geopolitical risks, reclamation and rehabilitation, closure plan, capital costs, operating costs, smelter terms, royalties, product marketing, sales contracts, financing, and commodity price forecasts. The relevant technical, economic, and related parameters and the level of uncertainty and limitations of all material assumptions made by the valuator should be disclosed in the valuation report or summarized from any technical report used as a source document.[296]

4.5.2 United States

In the United States, Regulation S-K governs environmental and climate disclosures.[297] As of the date of writing, the Securities and Exchange Commission has proposed new legislative requirements. Proposed *Items 1501 and 1502 of Regulation S-K* would require disclosure of any climate-related risks likely to have a material impact on the company's business or consolidated

[295] *CIMVAL*, *supra* at 26.
[296] *Ibid* at 20.
[297] Regulation S-K, *supra*.

financial statements that may manifest over the short, medium, and long term.[298] Therefore, selecting the appropriate discount rate is crucial when evaluating investments in climate change abatement, as adding the natural value could significantly increase risk.[299] Thus, all technical reports of listed issuers, including TMC, should include environmental and climate factors.

In contrast, the United States-based SME Guide recommends that reports account for environmental and social (sustainability) impacts expected during development, operation, and closure.[300] An SME valuator should review available and relevant information on environmental, health, permitting, and social or community considerations related to the project and its stage of development.[301] Consideration should be given to the following:

- results of any environmental and health studies,
- environmental issues that could materially impact the company's ability to extract Mineral Resources or Mineral Reserves,
- requirements and plans for stockpiles, waste and tailings disposal, site monitoring, and water management both during operations and post-mine closure,
- key project permitting requirements, the status of any such permit applications, and any known requirements for post-performance or reclamation bonds,
- potential social or stakeholder considerations for the project and the status of any major negotiations or agreements with local communities,
- projected mine closure (remediation and reclamation) requirements and costs,
- special capital or operating requirements for handling toxic minerals or reagents, as well as other health and industrial hygiene risks, and
- if applicable, "Conflict Minerals" should be considered and discussed.[302]

The SME Guide also includes provisions for the social license to operate.[303] For any forward-looking information, a warning must state:

> Certain information and statements contained in this Public Report are "forward looking" in nature. Forward-looking statements include, but are not limited to, statements with respect to the economic assumptions for the operation, Mineral Resource and Mineral Reserve estimates, mine production forecasts, the mine plan and development sequence, dilution and mining recoveries; processing method and production rates; metallurgical recovery; capital, operating and sustaining capital cost estimates; ability to maintain social license to operate; ability to meet government regulations; meeting environmental and permitting

[298] SEC, *The Enhancement and Standardization of Climate-Related Disclosures for Investors*, Exchange Act Release Nos. 33-11042; 34-94478; File No. S7-10-22, Fed.Sec.L.Rep. (proposed Mar. 21, 2022)
[299] Keith MacMaster, *Responsible Investing: Access Denied* (LLM, Dalhousie University, 2018) [unpublished]; *Submission to Expert Panel on Sustainable Finance*, by Keith MacMaster (Ottawa, Ont.: Smart Prosperity, 2019).
[300] *SME Guide supra note 103* at 33.
[301] *Ibid*.
[302] *Ibid*. See also Lockheed Martin's conflict minerals disclosure.
[303] *Ibid* at 59, 79. The Social License is canvassed in Chapter 6.

> requirements; estimates of reclamation obligations; and general business and economic conditions. The results depend on inputs that are subject to a number of known and unknown risks, uncertainties and other factors that may cause actual results to differ materially from those presented here.[304]

An additional warning adds that the Competent Persons have not independently reviewed environmental, permitting, closure planning, and social and community impacts. The SME indicates that the words "ore" and "reserves" should not be used in stating Mineral Resource estimates as the terms imply that technical feasibility and economic viability have been demonstrated. Such terms are only appropriate when all relevant mining, processing, metallurgical, economic, marketing, legal, environmental, infrastructure, social, and governmental factors have been considered. Reports and statements should continue to refer to the appropriate class or classes of Mineral Resources until technical feasibility and economic viability have been established by appropriate studies.[305]

The Australian VALMIN code requires that a technical assessment includes a project's environmental, social and heritage aspects.[306] They have more explicit instructions:

> Mining and processing methods grade control, mining loss and dilution, geotechnical, hydrological and climatic conditions, mineralogical and metallurgical factors likely to affect process recovery, flowsheet design, variability of the mineralized body's physical and chemical properties, metallurgical recoveries and performance, tailings and waste disposal, quantity and quality of final and intermediate products and waste, labour sources, requirements and productivity, operating practices and technologies employed or to be employed; equipment availability, utilization and performance, energy and water sources, recent trial mining and treatment data (for proposed operations), construction and commissioning schedules, marketability of products, revenue factors, commodity prices and exchange rates, product transport and realization issues, environmental, legal, statutory and social constraints and commitments, and closure and post-closure activities and schedules.[307]

Further, VALMIN requires that a Public Report disclose any material existing or potential obstacles to exploring, developing, or mining activity related to the Mineral Asset. These obstacles may include statutory, legal, technical, environmental, commercial, socio-

[304] *Ibid* at 90.
[305] *Ibid* at 91.
[306] VALMIN, *supra* at Part 7.
[307] *Ibid* at 24.

political, or other obstacles to future exploration, development or production.[308] None of these CIMVAL, SME or VALMIN requirements are utilized by the ISA.

The SEC has concerns with the quality of environmental information provided by TMC.[309] TMC filings do not mention or integrate the environmental performance guarantee, insurance, compensation fund, or environmental requirements. The SEC also commented on data requirement methodologies regarding the adequacy of sample preparation, security, and analytical procedures.[310] The issues with regulatory governance above are problematic. A seabed mining valuation code that requires the integration of all these other arrangements would solve many of these problems. The SEC has had further issues with environmental and social disclosures, as detailed in Chapter 6.

4.6 Royalties and Taxes

The quantity and frequency of payments being made to host governments is another source of risk for mining companies and host States.[311] A frequent source of disputes between host State governments and energy investors is governments' efforts to claim an enhanced share of resource rents (for example, when world energy prices increase suddenly or unexpectedly.[312] The principal instruments theoretically available to governments to address the general objectives of a fiscal regime for the mining industry are mining royalties, which are a percentage of production or gross revenue. Income or profit-based taxes, such as corporate and mineral rent taxes, target

[308] *Ibid* at 25.
[309] Regulation S-K, *supra* at Rule 436. The consent requirements of Rule 436 are generally directed at circumstances in which an issuer has engaged a third party expert or counsel to prepare a valuation.
[310] SEC, *Letter to TMC re Post-Effective Amendment No.1 to Registration Statement on Form S-1 Filed April 14, 2022* (10 May 2022); SEC, *Letter to TMC re Amendment No. 1 to Post-Effective Amendment No.1 to Registration Statement on Form S-1 Filed May 31, 2022* (21 June 2022); Regulation S-K, *supra* at Item 601 paragraph (96)(iii)(b)(8)(iv) and Regulation S-K Item 601 paragraph (96)(iii)(b)(11)(iii).
[311] Whitsitt & Bankes, *supra* note 3.
[312] *Ibid*; Richards, *supra* note 238.

profits above those required to attract investments.[313] Valuing ore is required for setting royalty payments, and there is a link between valuation codes and royalties.[314] Thus, having a valuation code helps nations determine royalty rates.

A royalty represents a share of the natural resource and is payable as compensation to a country for its removal.[315] Royalties differ in rate and taxable base and are not necessarily uniform between metals or companies. Depending on the amount of ore produced or the value created, they may vary between mines within a country.[316] Royalties are levied on the metals contained in a concentrate or an ingot, not on their extracted mineral, not *in situ*.[317] *In situ* comparisons are flawed as they do not consider the differences in recoverable, payable metal and cost structures.[318] It is possible to adjust unit prices to account for value differences.[319]

Some countries have a fixed royalty rate, but many also use a range based on factors such as whether the mineral is refined.[320] Peru increases the royalty rate with operating or profit margin, while the royalty rate in Chile depends on operational margin.[321] Ontario sets royalty rates based on what minerals are produced.[322] In other regimes, royalties are not dependent on

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[313] Seeger, *supra* note 3; Richards, *supra*; Mining Association of Canada, "Towards Sustainable Mining", online: https://mining.ca/towards-sustainable-mining/.
[314] James Otto, *Mining Royalties A Global Study of Their Impact on Investors, Government, and Civil Society* (World Bank Group, 2006); Ecorys, *Study to investigate state of knowledge of Deep Sea Mining*, FWC MARE/2012/06-SC E1/2013/04 (European Commission - DG Maritime Affairs and Fisheries, 2014); RMG Consulting, *Comparative Analysis of Tax Regimes of Land-Based Mining in 15 Countries* (ISA, 2020); Craig R Smith et al, "Deep-Sea Misconceptions Cause Underestimation of Seabed-Mining Impacts" (2020) 35:10 Trends in Ecology & Evolution 853–857; Kris Van Nijen et al, "The Development of a Payment Regime for Deep Sea Mining Activities in the Area through Stakeholder Participation" (2019) 34:1 JMCL 571–601; Kerry Krutilla et al, "Addressing Fundamental Uncertainty in Benefit–Cost Analysis: The Case of Deep Seabed Mining" (2021) 12:1 Journal of benefit-cost analysis 122–151; ISA, *Deep Seabed Mining – Payment Regime Workshop (PRW) #3* (Singapore: ISA, 2017).
[315] RMG Consulting, *supra* note 308 at 17.
[316] Richards, *supra* note 238.
[317] As shown later, the ISA is basing its royalty rate on the extracted mineral price.
[318] Jonathan Alexander Bell, *Risk Adjusted Evaluation of Mineral Assets Using Transaction Based Statistical Models* (Doctoral Thesis, Curtin University, 2019) [unpublished] at 285.
[319] *Ibid*.
[320] RMG Consulting, *supra* note 308.
[321] *Ibid*.
[322] *Ibid* at 22; RMG, *Analysis of Tax Regimes in 15 Countries - Annex* (ISA, 2020).

what minerals are produced. If the ore is polymetallic and royalties are different for various metals, the sales contracts need to be studied to understand how each metal is valued and then apply the various royalty rates for the different metals.[323] Rather, royalties are charged on the value reported by individual companies. Royalties are thus part of a changing landscape.

The royalty tax base tends to change with policy decisions taken and the capabilities of a country's tax authority. The royalty rate also follows policy decisions but is more influenced by an individual country's capability to charge a certain royalty rate, whether high or low. Many countries define specific fiscal terms in their legislation applicable to the mining industry. These terms are included in a mining code or other appropriate legislation. The advantage of a royalty is that it is easy to administer and can generate income over the entire project period.

National and sub-national governments may impose mining taxes on defined mining profits.[324] The mining taxes are levied on profits derived from the operations at the mining stage.[325] When designing a fiscal regime for extracting minerals, governments have several general objectives and goals for corporate taxation. Mullins and Burns note that these objectives include ensuring an appropriate overall level of government revenue over a project's lifetime, securing dependable government revenue during the project life, adjusting to volatility or prices, costs and geology, given the uncertainties in the sector, limiting systemic tax distortions to commercial decisions, limiting costs of administration and compliance, and ensuring transparency of fiscal terms and amounts paid by extractive industry companies.[326]

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[323] Many countries have developed standardized formulas for calculating the value of ore. The royalty rate can then be applied to this simulated ore value.
[324] NRCan, "Mining Taxation in Canada" online: https://www.nrcan.gc.ca/mining-materials/mining/taxation/mining-taxation-canada/8876.
[325] NRCan, "Mining-Specific Tax Provisions" online: https://www.nrcan.gc.ca/our-natural-resources/minerals-mining/mining-resources/tax-administration/8894.
[326] Peter Mullins & Lee Burns, "The fiscal regime for deep sea mining in the Pacific region" (2018) 95 Marine Policy 337 at 345.

Practically, since no fair market value of production can reasonably be established at the mining stage, the starting point of the tax computation is generally the profits from both mining and processing operations, usually with the deduction of a processing allowance (except in British Columbia, Alberta, Saskatchewan, and Prince Edward Island) that removes from taxable profits a given return on the investment in processing assets.[327] The processing allowance is computed as a given percentage (representing the allowed rate of return on processing investment) of the original cost of the processing assets.[328] Mining taxes and royalties paid to a province or territory concerning income from a mineral resource are fully deductible when computing income for federal income tax purposes.[329] Unfortunately, companies in the extractives sector (like oil, gas, and other mining companies) and financial services companies would be excluded from the policy.[330]

Other mineral taxes are often, but not always, designed to tax the mineral rent. Mineral rent is the difference between the production value for a stock of minerals at world prices and their total production costs.[331] As minerals in the ground are considered property of the State, the argument is that these rents, the excess profits, belong to the State or are privately held by the landowner. A total headline share or indicative government take varies between 35 percent and 55 percent in land-based mining regimes, including royalties, corporate income tax, and

[327] Income Tax Act, *supra at* s. 65(1), Saskatchewan, "Mining Royalties and Taxes" online; https://www.saskatchewan.ca/business/agriculture-natural-resources-and-industry/mineral-exploration-and-mining/mining-royalties-and-taxes; *The Crown Minerals Act, SS 1984-85-86, c C-50.2, The Mineral Taxation Act*, 1983 SS 1983-84, c M-17.1.
[328] *Income Tax Act*, *supra* at s 65(1), 125.1.
[329] *Ibid.*
[330] Additionally, the agreement sets up the adoption of a global minimum tax of 15 percent, which would increase taxes on companies with earnings in low-tax jurisdictions.
[331] *Mines and Minerals Act*, SA 2000, c. M-17, *Metallic and Industrial Minerals Tenure Regulation*, Alberta Regulation 145/2005, Alberta, "Minerals permits and leasing overview" online: https://www.alberta.ca/minerals-permits-and-leasing-overview.aspx, *Mineral Tenure Act*, RSBC 1996, c. 292, British Columbia, "Mineral and Placer Leases" online; https://www.alberta.ca/minerals-permits-and-leasing-overview.aspx.

additional profit/rent taxes.[332] The six most common problems found with resource financial systems include the adequacy/fairness of the tax regime for mining in the host country and the revenue allocation system, particularly when it constrains the efficient and effective use of public resources, including those generated by mining taxes and royalties; conflicts over land use and property rights, environmental damage and concerns, conflicts between large- and artisanal mining, the problems associated with mine closure.[333]

Very few countries use environmental levies, which are charges for environmentally harmful emissions, to mitigate potential environmental damage.[334] For example, there are no specific environmental levies for the mining industry in Canada.[335] Most countries prescribe emissions limits and demand that companies invest in measures to prevent emissions above the set limits.[336] The emissions levels are monitored during production, and if limits are surpassed, action is taken. Some countries enforce environmental taxes and levies in combination with setting limits to emissions to reduce environmental damages and cover costs for monitoring discharges to nature by mining activities. China, for example, has an Environmental Protection Tax, which prescribes air pollutants, water pollutants, solid waste, and noise pollution tax amounts. In most countries, companies must set aside funds to guarantee that rehabilitation after the closure of the project for whatever reason can still be made.[337] While prescribing limits to emissions, Australia also sets fixed fees for environmentally disrupting activities. The fees in

[332] Waye & Young, *supra* at 163.
[333] K MacPhail, "The Challenge of Mineral Wealth: Using Resource Endowments to Foster Sustainable Development" in *Mining, Society, and a Sustainable World* (Springer International Publishing, 2009).
[334] RMG Consulting, *supra* note 308.
[335] *Ibid* at 19.
[336] *Ibid*.
[337] Nova Scotia requires a reclamation security be provided by the mine operator to government prior to the beginning of mining - *Mineral Resources Act*, SNS 2016, c. 3, s. 88; State of California, "What is Mine Reclamation?" online: https://www.conservation.ca.gov/dmr/SMARA%20Mines/reclamation , California, *Surface Mining and Reclamation Act of 1975*, SMARA, Public Resources Code, Sections 2710-2796.

Australia (Queensland) are used for monitoring and cleaning up old mine sites. Poland has adopted a system that uses part of the royalty payments for environmental purposes.[338]

4.7 Conclusion

The influence of mineral valuation codes is much broader than the securities exchange linked to that particular code, with companies reporting to a particular code sometimes having projects located far from the securities exchange on which they are listed.[339] Valuing minerals according to a common standard simplifies administration, applies to everyone (private enterprise, government-owned entities), the authorities do not have to distinguish between arms-length and non-arms-length transactions, is more transparent, and encourages data collection and sharing.[340]

These codes only partially address environmental and social protection gaps and do not solve capitalization issues. It raises questions about the equitable sharing of profits from the Common Heritage of Mankind. It also raises issues with the interaction of valuation, royalties, and domestic taxes on land mining firms. The LTF marks a step toward a more realistic understanding of public capital market behaviour by introducing a human dimension to capital market theory. It stresses that legal traditions differ regarding their priority for private property rights. Contracts, therefore, need to provide a certain amount of flexibility to adjust for later changes. By referencing a sustainable seabed mining asset valuation code in an exploitation contract, the ISA could ensure that reserves are valued correctly such that additional

[338] 40% of the mining exploitation fee of royalty payments is set aside into a government-controlled environmental fund used for unspecified environmental purposes.
[339] Deloitte, "Mineral Valuation Codes" online: https://www2.deloitte.com/content/dam/Deloitte/za/Documents/energy-resources/ZA_MineralValuationCodes_EnergyResources_16012015.pdf.
[340] Jack Calder, *Administering Fiscal Regimes for Extractive Industries* (IMF, 2014) at 73; Martin Stuchtey & Adrien Vincent, *Ocean Solutions That Benefit People, Nature and the Economy* (Washington, DC: High Level Panel for a Sustainable Ocean Economy) at 60.

environmental protections can be assured. The question becomes whether the ISA has made any strides in such an endeavour.

Chapter 5 – Seabed Mining Finance

Chapter 5 reviews the Mining Code's financial provisions, emphasizing the financing plan, royalties and (lack of) environmental costs. Further, the lack of environmental protections in the Mining Code makes valuing environmental and social considerations extremely difficult. Next, a discussion on the work of the ISA, as it relates to the valuation of mineral resources and reserves, is undertaken. The ISA has not adopted a valuation code similar to the terrestrial codes shown in the previous chapter. Specifically, this section compares the reporting standard to a land-based mineral valuation code. Finally, a review of the work conducted by the ISA on the equitable sharing of resources, funds and guarantees is conducted. It is difficult to value the minerals found on the seabed properly.

5.0 Seabed Development Stages and Technologies

Seabed mining finance has several components.[1] I assert that the legal regime's structure sets the stage for how the financial mechanisms will work. How the law is structured helps dictate how finance is created, as indicated by Pistor's LTF. The first is capitalization, in which contractors and States obtain the necessary financing to plan and undertake to mine. Early entrants generally face higher risks and high capital requirements for mine development than later entrants. The second is the payment regime, which obtains financial returns from seabed mining contractors to extract minerals. The third is the distribution mechanism, based on the principles of equitable sharing, to distribute the revenue and economic benefits. The ISA receives the royalties and distributes benefits following equitable criteria. The fourth is the insurance scheme, which offers protection should harm occur. The compensation regime consists of funds, guarantees, and

[1] Kris Van Nijen et al, "The Development of a Payment Regime for Deep Sea Mining Activities in the Area through Stakeholder Participation" (2019) 34:1 JMCL 571 at 575. Note that the cut-off date for research is December 2022. Thus, the ISA's 2023 Sessions and 2023 MIT Group updates are excluded from the analysis.

bonds to offset any gaps in payments. Different payment regimes create incentives, risks and varying levels of costs. It is anticipated that costs for seabed mining will be greater than land-based mining, at least for sulphides and crusts.[2]

There are typically five mining development stages, each with technological, legal, and financial challenges.[3] Valuation codes further separate valuation into additional levels based on the stage of mining development. They are prospecting or pre-feasibility, exploration, design and construction, exploitation, and closure.[4] The first stage, 'prospecting' or pre-feasibility, includes discovering economically viable deposits.[5] Financing is through an association of financiers who put up seed capital.[6] The three *Exploration Regulations* govern this activity.

The second stage, exploration or feasibility, is a preliminary evaluation of the project and involves scientific background research and testing to determine whether a significant quantity of minerals exists that would justify large-scale mining operations.[7] High-risk projects have larger discount rates—the higher the risk, the lower the NPV.[8] Environmental and social issues should increase the risk of a project. The third phase involves the design of the mining operation.[9] The *Draft Exploitation Regulations* govern this stage.

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[2] ISA, *Developing a Financial Model for Other Deep Sea Minerals* (undated) online: https://isa.org.jm/files/files/documents/analyzing.pdf; A Chin & K Hari, *Predicting the impacts of mining of deep sea Polymetallic Nodules in the Pacific Ocean: A Review of Scientific Literature* (MiningWatch Canada, 2020).
[3] Canadian Chamber of Commerce, Mining capital: How Canada has transformed its resource endowment into a global competitive advantage (Canadian Chamber of Commerce, 2013) at 14; Michael Seeger, *Mining Capital* (Switzerland: Springer, 2019) at 21–31.
[4] AMEC Mining and Minerals, *Capital Cost Estimating for Mineral Processing Plants*, by (University of British Columbia, 2018). As no feasibility study current exists at the date of writing it is difficult to estimate capital costs.
[5] AMC, Technical Report Summary: TOML Mineral Resource, Clarion Clipperton Zone, Pacific Ocean for DeepGreen Metals Inc. SEC Regulation S-K (subpart 1300) AMC Project 321012 (26 March 2021).
[6] ECA Group, "ROV Solutions" online: https://www.ecagroup.com/en/find-your-eca-solutions/rov.
[7] AMC Consultants, *supra* note 5 at 129; Marcel Rozemeijer et al, "Seabed Mining" in Kate Johnson & Gordon Dalton, eds, *Blue Growth and the New Maritime Economy* (The Netherlands: River Publishers, 2018) at 104, 128
[8] AMC Consultants, *supra* note 5 at 147.
[9] AMEC Mining and Minerals, *supra* note 4; TMC, "The Metals Company Enters into Business Collaboration MoU with Epsilon Carbon to Complete A Pre-Feasibility Study For the World's First Commercial Polymetallic Nodule Processing Plant in India" online: https://www.globenewswire.com/news-release/2022/03/17/2405214/0/en/The-Metals-Company-Enters-into-Business-Collaboration-MoU-with-Epsilon-Carbon-to-Complete-A-Pre-Feasibility-Study-For-the-World-s-First-Commercial-Polymetallic-Nodule-Processing-Pl.html (access 20 May 2022).

Fourth is exploitation, which is the commercial mining of these minerals. Cash flow projections are required for obtaining financing for commercialization, and bankers require projections of revenue, capital expenditures ("CAPEX"), operating expenditures ("OPEX"), royalties, and taxes.[10] The *Draft Exploitation Regulations* govern these activities. The extraction process starts with excavation. A precise classification of mining methods is lacking for nodule mining. The closest comparison (albeit not entirely accurate) is terrestrial strip mining.[11] A proposed mining method for nodules involves mining a field partitioned into long, narrow strips, similar to practices in farming.[12] To excavate minerals, vehicles will cut or strip substrate, producing large sediment plumes that discharge waste and tailings back into the ocean.[13] During a Global Sea Mineral Resources demonstration project, a subsea polymetallic nodule collector prototype, "Patania II," suffered a cable problem, resulting in a loss of contact and significant delays.[14] Mining hydrothermal sulphides and crusts will require either drilling or crushing hard rocks.[15] This technology is significantly more complex than that used for mining nodules.[16] No methods are currently in use for mining cobalt crusts.

[10] Rozemeijer et al, *supra* note 7 at 76, 115, 118, 121; Luc Cuyvers et al., *Deep seabed mining A rising environmental challenge* (IUCN: Gallifrey Foundation, 2018) at 74.
[11] Sebastian Volkmann, *Blue Mining—Planning the Mining of Seafloor Manganese Nodules* (PhD Thesis, RWTH Aachen University, 2018) [unpublished] at 33.
[12] Rozemeijer et al, *supra* note 7; Satya Nandan, Lodge, Michael & Shabtai Rosenne, The Development of the Regime for Deep Seabed Mining (Center for Oceans Law and Policy: University of Virginia, 2002); Catherine Banet, *The Law of the Seabed: Access, Uses, and Protection of Seabed Resources* (Leiden, 2020).
[13] GSR, "Global Sea Mineral Resources unveils the Patania II nodule collector" (14 October 2018) online: https://dsmobserver.com/2018/10/global-sea-mineral-resources-unveils-the-patania-ii-nodule-collector/.
[14] Hieronymus Bosch, "DEME Starts Subsea Mining, China Watches Closely" (April 19, 2021) Baird Maritime online: https://www.bairdmaritime.com/work-boat-world/offshore-world/column-deme-starts-subsea-mining-test-in-pacific-ocean-china-watches-closely-offshore-accounts/.
[15] Donald Anton & Rakhyun Kim, "Precautionary and Adaptive Management Approaches in the Seabed Mining context: Trans-Tasman Resources Ltd. marine consent decision under New Zealand's Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012" (2015) 30:1 Int J Marine Coastal L 175 at 177.
[16] Walter Roest & Harald Brekke and Malcolm Clark, "The Scientific Challenges of Seabed Mining" in Routledge Handbook of Seabed Mining (Routledge, 2022).

After excavation comes the vertical lifting of the ore, whereby collectors take the mined ore from the seabed to the ocean surface.[17] All proposed technologies are under development and do not exist commercially.[18] Environmental issues could arise from an ore spill or waste sediment from the lifting process. For example, Japan Oil, Gas and Metals National Corporation ("JOGMEC") carried out the world's first pilot test of excavating and ore lifting for seafloor polymetallic sulphides in 2017, and it was reported that there were significant issues with their riser pumps when testing their retrieval system.[19] Once transported to the surface, the ore is transferred onto (or into) a second vessel.[20] Around ten (10) percent of the extracted material would be processed, with tailings discharged via a deposition pipe into the previously mined area.[21] Waste remaining contains potentially toxic components.[22] Final processing will take place onshore in dedicated processing facilities.[23] Some ores (manganese and cobalt) pose problems and require extensive energy input, and a dedicated onshore processing plant is required. Processing ore involves environmental challenges, waste, tailings ponds, leakage, emissions, and other problems. However, the processing is outside the scope of this dissertation.

The final stage, closure and remediation, occurs at the end of the mine's life. [24] Ideally, a mine should be remediated so that the environment is returned to its condition before the mining occurs. In land-based mining, most regulatory agencies require land reclamation and closure

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[17] Kerry Krutilla et al., *Implementing Precaution in Benefit-Cost Analysis*, Policy Research Working Paper 9307 (World Bank Group, 2020) at 4.
[18] *JOGMEC Integrated Report 2019* at 28.
[19] *Ibid*; Roest & Harald Brekke and Malcolm R. Clark, *supra* note 16 at 12.
[20] Amaya Menendez, *Controls on the composition and extraction of rare earth elements and yttrium (REY) in deep sea polymetallic nodules and sediments* (Unpublished, 2018); Blue Nodules, *D2.12 Design report for full-scale mining Final* File: t3-tO-2O2O, online: https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5b52a491b&appId=PPGMS.
[21] Anton & Kim, *supra* note 15 at 178.
[22] Volkmann, *supra* note 11 at 17; W Ma, DL Schott & G Lodewijks, "A new procedure for deep sea mining tailings disposal" (2017) 7:4 Minerals (Basel) 47 at 47–48.
[23] AMC Consultants, *supra* note 5 at vii, 94.
[24] Canadian Chamber of Commerce, *supra* note 3 at 14; Seeger, *supra* note 3 at 21–31.

plans, which are important parts of feasibility studies.[25] Such plans contain information on how environmental protection will be achieved and how the mine site will be returned to an allowable condition.[26] The *Draft Exploitation Regulations* have provisions dealing with closure plans; however, there are no *Draft Standards or Guidelines* for closure.[27]

Environmental and social harm can occur at any stage of the mining lifecycle.[28] There is a risk of undercapitalization of contractors and States and a real potential that environmental damage will go unrepaired, especially at the exploitation and closure stages.

5.1 Seabed Finance Law – Financial Provisions

Seabed mining finance revolves around equitable sharing, Common Heritage of Mankind, equal treatment of seabed and land-based mining, and optimization of revenues for the ISA.[29] UNCLOS delegates to the ISA to provide for the equitable sharing of financial and economic benefits derived from activities in the Area through any appropriate mechanism on a nondiscriminatory basis.[30] Article 160 mandates that the ISA Assembly consider and approve regulations and procedures on the equitable sharing of financial and other economic benefits and

[25] JM Otto, "Global trends in mine reclamation and closure regulation" in: J Richards *Mining, Society, and a Sustainable World* (Springer, 2010); Mari Paananen, Emmeli Runesson & Niuosha Samani, "Time to clean up environmental liabilities reporting: disclosures, media exposure and market implications" (2021) 45:1 85–116.
[26] Alyson Warhurst & Ligia Noronha, "Corporate strategy and viable future land use: Planning for closure from the outset of mining" (2009) 24 Natural Resources Forum 153.
[27] *Draft Regulations on Exploitation of Mineral Resources in the Area* (2019), ISBA/25/C/WP1 at Annex VIII.
[28] Tara Davenport, *Responsibility and Liability for Damage Arising Out of Activities in the Area: Potential Claimants and Possible Fora*, CIGI Liability Series for Deep Seabed Mining - Report 5 (2019) at 10, 13; Julian Aguon & Julie Hunter, "Second Wave Due Diligence: The Case for Incorporating Free, Prior, and Informed Consent into the Deep Sea Mining Regulatory Regime" (2019) 38:1 Stanford ELJ at 19; David Stauth, "Hydrothermal Vents, Methane Seeps Play Enormous Role in Marine Life" (2016) Global Climate.
[29] ISA, "Equitable sharing of financial and other benefits from deep seabed mining" online: https://equitablesharing.isa.org.jm/.
[30] *United Nations Convention on the Law of the Sea* 1833 UN Treaty Series 397, 1982 at Article 140(2); ISA, "Open-ended working group on the financial terms of contracts" online: https://www.isa.org.jm/the-mining-code/working-groups/.

the payments and contributions made, considering the interests and needs of developing States and peoples who have not attained full independence or other self-governing status.[31]

Financial provisions for seabed mining were designed to ensure optimum revenues for the ISA or be used to assist developing States in exploiting marine minerals.[32] Annex III, Article 13 of UNCLOS identifies the guiding objectives for financial terms of contracts.[33] Other goals of UNCLOS's financial provisions included prioritizing commercial production, attracting investments and technology to the exploration and exploitation of the Area, ensuring equality of financial treatment and comparable financial obligations for contractors, and providing contractors with uniform and non-discriminatory incentives to undertake joint arrangements with the Enterprise. Finally, a goal of financing seabed mining under UNCLOS is that contractors must not be subsidized to be given an artificial competitive advantage over land-based miners.[34]

The *1994 Agreement* amended Annex III Articles 13(3)-(10) and abandoned the formula for determining royalties and profit shares.[35] The *1994 Agreement* postponed the annual fee, rendering it payable only from the commencement date of commercial production and leaving the level of that fee to be established.[36] The *1994 Agreement* also updated UNCLOS regarding establishing rules, regulations, and procedures for financial terms of contracts. It ensured that the payment system would not be complicated and would not impose significant administrative costs on the ISA or the contractor.[37] Rates of payments will be comparable to land-based mining of similar minerals to avoid giving seabed miners an artificial competitive advantage or

[31] *Ibid* at Article 160.
[32] *Ibid* at Article 173.
[33] *Ibid* at Annex III, Article 13.
[34] *Ibid*.
[35] *Agreement relating to the implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982*, 1836 UNTS 42 1994 at Annex, s. 8; Nandan, Lodge, Michael & Rosenne, *supra* note 12 at 14.
[36] *Ibid* at Annex, s. 8(1)(d).
[37] *Ibid* at Annex, s. 8(1)(c).

disadvantage.[38] Flexibility mechanisms were added, including the security of contractual terms, assurances against the unilateral imposition of new burdens and restrictions, the prevention of the imposition of production or price controls or designation of markets, and assurances against discriminatory increases in the governmental "take," whether by taxes, royalties, or other exactions, which may put the particular operation at a competitive disadvantage, were added to the amendments, as was the right to judicial review of any adverse governmental action.[39]

The ISA would develop the payment mechanism through the *Mining Code* and its internal procedures.[40] In 2013, partly the result of the *Seabed Advisory Opinion*, the ISA commissioned a study to compare and determine "best practices" of terrestrial mining to begin work on financial provisions for seabed mining.[41] The 2014 resulting study created a list of eighteen issues that remain to be solved prior to creating the financial regime for seabed mining.[42] These eighteen issues can be grouped into themes. These themes include the complex

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[38] *Ibid* at s. 8(1)(b).
[39] Eugene Miller & Joseph Delehant, "Deep Seabed Mining: Government Guaranteed Financing under the Maritime Aids of the Merchant Marine Act, 1936" (1980) 11:4 J Mar L Comm 453.
[40] 1994 *Agreement, supra note 35* at Annex, s. 8(1); *UNCLOS*, *supra* note 30 at Annex III, Article 13(1).
[41] ISA, *Developing a Regulatory Framework for Mineral Exploitations in the Area: Discussion Paper on the Development and Implementation of a Payment Mechanism in the Area* (2015) *A Discussion Paper on the development and drafting of Regulations on Exploitation for Mineral Resources in the Area (Environmental Matters)* (ISA, 2017).
[42] *Ibid* at 13-13. The eighteen (18) issues identified are:
1. The complex financial interaction between all parties drives the need for an international conference of key stakeholders.
2. Financial terms are not independent and must be seen as part of a total package including environmental impacts, CSR and CHM benefit sharing.
3. Detailed financial modelling and economic analysis is required to support any high level findings.
4. Some land-based mining fiscal regimes are now inherently flawed. Many are in transition.
5. There is one simple trade-off in any payment mechanism: administrative capacity versus optimal (best) revenue opportunity.
6. There is a complex trade-off & discussion between the division of normal profit and economic rents
7. Fiscal transparency in Extractive Industries is driving exponential change. EITI principles will need to be reflected in the ISA financial regime.
8. Aligning financial accounting requirements and profit share will reduce administrative complexities.
9. A full understanding of the seabed mining value chain is needed to determine an appropriate valuation point.
10. Establish a trust fund to cover damage to the environment not covered by UNCLOS.
11. Whether a premium should be attached to the non-renewable nature of mineral resources is undecided.
12. A "safety valve" should be built-in to the mechanism which kicks in during periods of high pricing or end of life

financial interaction between all parties and impacts, the need to develop financial terms as part of a total package, including environmental impacts, corporate social responsibility and benefit sharing following the Common Heritage of Mankind, and the need for additional research into the valuation of the mineral asset.

The ISA study noted that "financial terms are not independent and must be seen as part of a total package including environmental impacts, and CHM [sic] benefit sharing."[43] They recommended that social factors and costs be included in any financial regime to value the Common Heritage of Mankind and the environment.[44] The ISA study also recommended that the ISA should establish a trust fund to cover damage to the environment.[45] A note of caution averred that "some land-based mining fiscal regimes are now inherently flawed."[46] Land-based mining should not solely be the basis for developing a financial model for seabed mining.

Based on an accompanying review of land-based mining tax regimes relevant to the minerals expected to be extracted from the deep ocean floor, the ISA concluded that incentives for attracting investments should be specific, targeted, costed, and temporary.[47] They added that some country incentives make little financial sense.[48] The application for an exploitation licence should include and be conditional upon the successful completion of the commercial pilot study,

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13. In developing any incentives for attracting investments these should be specific, targeted, costed and temporary. Some country incentives make little financial sense.
14. A profit / rent-share model need not be unnecessarily complicated. But any discussion over defining acceptable levels of financial return is complex.
15. Closure & reclamation require upfront consideration under the payment mechanism.
16. The payment mechanism must support commercially sound principles. It must not support wasteful & inefficient mining practices.
17. The treatment of exploration costs requires close attention and careful consideration.
18. The concept of a “fair and equitable” share among mining participants has yet to be determined.

[43] *Ibid* at 10.
[44] ISA, *supra* note 41 at 14, 18, 29, 75; ISA, *supra* note 41.
[45] *Ibid*.
[46] ISA, *supra* note 41 at 11.
[47] *Ibid* at 14, 18, 29, 75.
[48] Elaine Baker & Yannick Beaudoin, eds, *Deep Sea Minerals and the Green Economy* (Secretariat of the Pacific Community, 2013) at 38.

the approval of a detailed bankable feasibility study and full environmental impact study, and the proposed operator's technical, fiscal and environmental qualifications.[49] The final theme revolved around the profit model, which should not be "unnecessarily complicated."[50] The payment mechanism must support commercially sound principles and must not support wasteful and inefficient mining practices. Detailed financial modelling is required as any payment mechanism has trade-offs: administrative capacity versus optimal (best) revenue opportunity and division of profit and economic rents. It was agreed that closure and reclamation require upfront consideration under the payment mechanism. Contrary to their "total package approach," it was undecided whether a premium should be attached to the non-renewable nature of mineral resources. The report concluded that "a full understanding of the value chain is needed to determine an appropriate valuation point."[51]

Further work from 2015 through 2018 explored the key elements of payment mechanisms and financial regulations applicable to exploitation contracts for nodules.[52] The draft financial terms of contracts, first released in 2016, were designed to ensure optimum revenues for the ISA, attract investments and technology, give equal treatment to contractors, be fair to contractors, provide an easy means of compliance, not be complicated to administer, be open to periodic review and be comparable to land-based mining.[53] ISA workshops held between 2015 and 2019 focused on the certainty of financial terms, the stability of financial mechanisms, and the avoidance of Sponsoring States of convenience.[54] Participants were concerned about the

[49] *Ibid* at 39.
[50] ISA, *supra* note 41.
[51] *Ibid*.
[52] RESOLVE, "DSM Project - Home", online: www.resolve.ngo/site-dsm/default.htm; Peter Jantzen & Capital Power Management Ltd, *DSM financial cost and modelling: Payment Regime Workshop* (London, 2016); *Deep Seabed Mining Payment Regime Workshop #2 Workshop Summary* (London: ISA, 2016).
[53] ISA, *supra* note 41.
[54] CIL/ISA, *Mineral Exploitation in the Area* (Singapore, 2015).

potential for certain States to have weak domestic regulatory frameworks, leading to Sponsoring States of convenience.[55] Another workshop concerned the direct, indirect, and cumulative environmental impacts of seabed mining and the role and transparency of the ISA.[56] One workshop presentation member asked, "Does the royalty/payment regime equal the full compensation of CHM?"[57] A proposal during a 2017 payment regime workshop recommended that a transitional financial regime be created to encourage the growth of the seabed mining industry and ensure its sustainable development.[58] A regime would comprise a simple fee structure of an annual flat fee and a royalty payment, accounting for all direct and indirect costs and benefits, including environmental and social spillover effects.[59] Stakeholders indicated the need for a seabed sustainability fund (or an environmental liability trust fund) and an environmental bond or guarantee.[60] As of July 2022, no interim financial regime has been proposed by the ISA. The research identified a need to change the definition of the weighted average cost of capital, signalling a desire to move to a comprehensive wealth-based financial system.[61]

The question becomes whether any of these important themes have been included in the *Mining Code*, especially regarding valuation and the inclusion of environmental and social discounts. It is beyond the scope of this dissertation to comprehensively detail all financial provisions. The next section reviews the *Draft Exploitation Regulations* in the context of the regulatory environment for seabed mining finance. These provisions cover plans of work,

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[55] *Ibid* at 3.
[56] Bellagio, *Deep Seabed Mining Fiscal Framework* (Bellagio, Italy: World Economic Forum, 2015).
[57] Harold Brekke, *ISA and Sponsoring States Components* (London: Norwegian Petroleum Directorate, 2016) at 12.
[58] ISA & Pew, *supra* note 52; ISA, Deep Seabed Mining – Payment Regime Workshop (PRW) #3 (Singapore: ISA, 2017).
[59] ISA, Workshop (PRW) #3 *supra* note 58 at 13.
[60] *Ibid* at 4.
[61] Cost of capital can be thought of how expensive it is for a company to operationalize a project. It is represented by the cost of debt plus the cost of equity.

royalties, and environmental discounts. The provisions relevant to an environmentally and socially responsible/sustainable mineral asset valuation code are reviewed.

5.1.1 Financing Plan

Part VII of the *Draft Exploitation Regulations* addresses the financial terms of exploitation contracts.[62] This part ensures equality of financial treatment and comparable financial obligations for contractors.[63] The ISA may provide financial incentives to contractors in some scenarios to attract contractors into entering joint ventures with the Enterprise.[64] Annex III to the *Draft Exploitation Regulations* contains the information required for the Financing Plan. A Financing Plan should include all details and costs of the mining technique, technology, and production rates applicable to the proposed mining activities, including those costs applicable to the extraction and onboard processing of the mineral ore. These costs include the regulatory requirements relevant to the proposed mining activities, including preparing and implementing the Environmental Management and Monitoring Plan and Closure Plan, capital expenditure requirements, revenues, cash-flow forecast and valuations. The *Draft Exploitation Regulations* stated that *in situ* calculations could use wet tonnes. The 2022 revision to the *Draft Exploitation Regulations* requires a contractor to use dry tonnes of unprocessed ore.[65]

[62] *Draft Regulations on Exploitation of Mineral Resources in the Area* (2019), ISBA/25/C/WP1 at Part VII.
[63] *Ibid* at Regulation 62.
[64] *Ibid* at Regulation 63.
[65] ISA, *Fifth Meeting of the Open-ended Working Group of the Council on the financial terms of a contract under article 13, paragraph 1 of Annex III to the United Nations Convention on the Law of the Sea and under section 8 of the Annex to the Agreement relating to the implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 198*2 (18-19 July 2022) Kingston *Briefing Note Prepared by the Chair of the Open-ended Working Group of the Council* (OEWG) at 5; Draft Exploitation Regulations, *supra note* 62, at Regulation 71.

5.1.2 Royalties

Royalties are levies on production, charged either as a fixed fee per unit of production ("specific" royalties) or as a percent of (a measure of) the value of production ("ad-valorem" royalties).[66] Another definition includes, as part of a royalty, the law creating the tax, the payment made to the owner of the mineral as compensation for transferring to the taxpayer the ownership of that mineral or the right to sell that mineral and the compensation to a country for the removal of a non-renewable resource.[67] Royalties and the law are intertwined, as indicated by Pistor's LTF.

The ISA collects royalties and will distribute payments to developing nations based on the principles of the Common Heritage of Mankind.[68] This system will include a payment mechanism, establishing financial terms for exploitation contracts, a method of revenue collection, and a means of benefit sharing and distribution.[69] From the commencement of commercial production, a contractor shall pay a royalty for the mineral-bearing ore sold or removed.[70] All payments to the ISA shall be made on a gross basis and be free of any deductions, transmission fees, levies, or other charges. However, the Secretary-General of the ISA may issue guidelines with respect to the form, amount, administration, and management of royalties.[71] The ISA has created several *Draft Standards and Guidelines* and has changed the royalty calculation from wet tonnes to dry tonnes of minerals recovered from the seafloor.

The definition of commercial production becomes critical, as it is the threshold at which royalty liability will begin to accrue. Commercial production begins when a contractor engages in sustained large-scale recovery operations that yield sufficient materials to indicate that the

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[66] Jack Calder, *Administering Fiscal Regimes for Extractive Industries* (IMF, 2014); Peter Mullins & Lee Burns, "The fiscal regime for deep sea mining in the Pacific region" (2018) 95 Marine Policy 337; Otto, *supra* note 25.
[67] Thomas Baunsgaard, *A Primer on Mineral Taxation*, IMF Working Paper WP/01/39 (IMF, 2001).
[68] *Draft Exploitation Regulations*, *supra* note 62 at Part VII, ss. 2, 3; *UNCLOS*, *supra* note 30 at Article 140(2).
[69] *Ibid* at Regulation 64.
[70] *Ibid*.
[71] *Ibid* at Regulation 65.

principal purpose is large-scale production rather than production intended for information-gathering, analysis, or testing equipment.[72] The *Draft Exploitation Regulations* acknowledge that "a clearer definition of commercial production will be needed."[73]

In 2017, the Belgian contractor, Global Sea Mineral Resources ("GSR"), first described in Chapter 3, provided an operational expense analysis to the public. GSR used a total cost approach that explored unknown costs, including costs coming from regulatory compliance.[74] GSR acknowledged that its model was incomplete, as there are more unknowns than knowns with seabed mining and recommends an increased understanding of the financial requirements.[75] There is a need for research on critical metrics and key cost drivers, such as project phases (pre-feasibility, feasibility, construction), mine life, nodule content, and metal extraction.[76]

As part of the royalty drafting process, the ISA, in 2018, contracted the Materials Systems Laboratory at the Massachusetts Institute of Technology (the "MIT Group") to provide a comprehensive study on seabed mining finance ("MIT Report").[77] The MIT Report explored four models developed to determine the economic consequences of potential ISA royalty regimes.[78] All four models assumed a collection operation of 3 million dry tons ("MT") of nodules per year and were structurally very similar, and most of those differences are methodological.[79] The report did not include the models themselves, and the authors

[72] *Ibid* at Schedule; *UNCLOS*, *supra* note 30 at Annex III, Article 17(2)(g).
[73] *Ibid* at Schedule, Footnote 1.
[74] Global Sea Mineral Resources, *DSM System Operational Expense Variables*, Deep Seabed Mining Payment Regime Workshop #2: Developing a Financial Modeling Framework (London, 2017).
[75] *Ibid*.
[76] *Ibid*.
[77] Randolph Kirchain, Frank Field et al., *Financial Regimes for Polymetallic Nodule Mining: A Comparison of Four Economic Models* (MIT - MSL Material Systems Laboratory, 2019).
[78] *Ibid* at 2, 10.
[79] A later 2021 updated model reduces this amount significantly as described below. TMC is assuming 1.3 MT of nodules.

acknowledge they did not have access to one model.[80] Differences in models were based on assumptions about an uncertain future mining operation.[81] Other differences included operational scope, analysis period, metals recovered, metals content, metals pricing, gross values, capital expenses, operational expenses, remediation cost assumptions, Sponsoring State tax rates, royalty rates, and ISA fees.[82] The study stated, "further discussion of these parameters will be produced to enable the Council to reach consensus on an appropriate payment mechanism for seabed mining."[83] None of the models include environmental fees.[84]

The MIT Group, also in 2018, presented the fundamental economic issues underlying the challenge of setting a payment mechanism for seabed mining and the methodologies developed to explore these issues.[85] The study's objective was to present a working framework for analyzing, evaluating, and negotiating potential payment mechanisms and financial terms.[86] Other goals in the MIT model include provisions for stability, certainty, and predictability (time consistency) in the early years of production. The ISA would secure its optimum revenues, and the system is "fair" to a contractor and the ISA.[87] The MIT Group noted that the ISA considers three types of royalty models: value-based, profit-based, and unit-based. Finally, fixed fee arrangements have one fee regardless of profit, or amount of ore recovered. The ISA is not considering this approach.[88]

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[80] Randolph Kirchain et al., *Development of an Economic Model and System of Payments for the Exploitation of Polymetallic Nodules in the Area* (MIT Materials Systems Laboratory, 2019) at 9.
[81] *Ibid* at 7.
[82] *Ibid* at 8.
[83] *Ibid* at 9.
[84] *Ibid* at 11.
[85] *Ibid*.
[86] *Ibid*.
[87] *Ibid* at 11–12.
[88] ISA, *Briefing Note for the open-ended informal working group of the Council on the financial terms of contracts* (ISA, 2019).

In value-based/ad-valorem models, the royalty payment is proportional to the market value of the resources within the ore.[89] This approach requires considerably more monitoring and analysis than a specific royalty, but it also responds to changes in resource values.[90] Most land-based mining countries employ a value-based royalty system.[91] The royalty rates among these countries vary between 1-20 %.[92]

In profit-based royalty systems, the payment is proportional to the profit of the mining activity in a given period. This system adjusts to changes in resource value and operational costs but is more costly to administer. They require additional information about the paying entity and are more susceptible to accounting manipulation.[93] Ontario employs tax exemptions for new mines for 3 or 10 years to encourage new development. Chile's specific mining tax is based on the volume of refined copper produced.[94] Profit-based royalties are fairly common. The tax payable is calculated at the applicable tax rate on the net operating income of the mining company.[95] A possible downside of profit-based royalties is that a mining operation will mine the minerals but not turn a profit or take longer to generate profit than anticipated.

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[89] ISA, *Report of the Chair on the outcome of the third meeting of the open-ended working group of the Council in respect of the development and negotiation of the financial terms of a contract under article 13, paragraph 1, of annex III to the United Nations Convention on the Law of the Sea and section 8 of the annex to the Agreement relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982,* ISA Doc. ISBA/26/C/8 (17 February 2020) at paras 2-3, 5-10; MIT, ISA: *Financial Payment System Working Group Meeting* (13-14 February 2020) online: https://isa.org.jm/files/files/documents/cost_workshop-ppt.pdf; MIT, "Financial Model Updates Polymetallic Nodules" ISA Webinar (26 October 2020) online: https://isa.org.jm/files/files/documents/MIT_0.pdf. By way of comparison, the payment system for continental shelf exploitation beyond 200 nautical miles is on an *ad valorem* royalty basis with a rate that increases over the project's lifetime: UNCLOS, *supra* note 30 at Article 82(2).

[90] Kirchain & Field, *supra* note 80.

[91] Otto, *supra* note 25.

[92] PwC., "Corporate income taxes, mining royalties and other mining taxes A summary of rates and rules in selected countries" (June 2012) online: https://www.pwc.com/gx/en/energy-utilities-mining/publications/pdf/pwc-gx-miining-taxes-and-royalties.pdf.

[93] RMG Consulting, *Comparative Analysis of Tax Regimes of Land-Based Mining in 15 Countries* (ISA, 2020); RMG, *Analysis of Tax Regimes in 15 Countries - Annex* (ISA, 2020).

[94] *Ibid*.

[95] *Ibid*; Kirchain & Field, *supra* note 80.

For unit-based processes, payment is based on the volume of units (mass in tonnes) removed from the ore. This approach is the simplest to administer. However, unit-based payments do not respond to value or mining economics changes. Unit-based payments are generally limited to low-value resources and are not considered further in this dissertation.[96]

According to the MIT Group, a fixed-rate royalty does not produce optimum revenues for the ISA compared with other alternatives.[97] Very small changes in rates of return greatly impact ISA revenues. Assured and stable revenue streams are preferable to the potential downsides of a profit-based mechanism.[98] Small changes in the royalty rate have large detrimental effects on attracting investment, even though these early models showed that contractors could achieve a seventeen percent internal rate of return (17%) or higher.[99]

Appendix IV of the *Draft Exploitation Regulations* provides information concerning determining royalty liabilities.[100] The value of the mineral-bearing ore shall be an assumed gross value per metric tonne and is the simple summation of the Relevant Metal Values multiplied by the applicable royalty rate for each Relevant Metal and the quantity (in metric tonne) of the mineral-bearing ore sold or transferred at the date of valuation.[101] The Relevant Metal Value is the assumed gross value(s) of a Relevant Metal calculated as the product of its Average Listed Price and Average Grade.[102] The Valuation Point is the point of the first sale or the first point of transfer of the mineral-bearing ore by delivery onto a vessel.[103]

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[96] Australia (Queensland) does employ flat fees per tonnes produced for some minerals.
[97] Kirchain et al, *supra* note 80 at 10–12.
[98] *Ibid* at 13.
[99] Kirchain et al, *supra* note 80 at 10–12; ISA, *supra* note 88.
[100] *Draft Exploitation Regulations*, *supra* note 62 at Appendix II, IV. As of the date of writing, it is indicative and presented for discussion only.
[101] Gross *in situ* values are not acceptable in land based mining, as shown in Chapter 4. The Relevant Metals are lithium, cobalt, copper, and nickel.
[102] *Draft Exploitation Regulations*, *supra* note 62 at Appendix IV.
[103] *Ibid*.

In March 2020, the ISA sought and received feedback on the assumptions used to analyze prospective payment systems' financial consequences.[104] The MIT Group significantly updated their model based on this feedback.[105] They noted that the payment system should be evaluated to ensure it does not unfairly subsidize (or disincentivize) seabed mining relative to pertinent land-based mining operations.[106] They noted that "one set of comments specifically mapped this issue to the selection of a minimum attractive rate of return for the collection contractor, noting that they felt that a seabed contractor does not require a higher rate of return to motivate mine operation, this differs from previous feedback received by the research team."[107] The researchers reduced the assumed rate of collection by stating that:

> Previously reported analyses assumed that contractors used one seafloor collector to extract approximately 3 million dry tons per year of nodules throughout most of the operating life of the mine. One stakeholder pointed the modelling team to a previous ISA report on nodule abundance and noted that this collection rate was not feasible given known abundance distribution and current collector technology. Instead, around 2.3 million dry tons per year was a more reasonable rate of collection for a single collector.[108]

This is a significant departure and will impact profitability. Other stakeholder comments further altered profitability calculations.[109] Comments include requirements to change assumptions on the longer time for facilities to be constructed and for ramp to full production to occur, the uncertainty in future model prices should be larger than was previously assumed, recovery efficiencies will be lower than previously assumed, and better inclusion of a marginal rate for

[104] ISA, ISBA/26/C/8, *supra note 89*.
[105] Randolph Kirchain, & Richard Roth, Frank R Field, III, Carlos Muñoz-Royo, and Thomas Peacock, *UPDATE: Report to the International Seabed Authority on the Development of an Economic Model and System of Payments for the Exploitation of Polymetallic Nodules in the Area Based on Stakeholder Feedback*, (MIT Materials Systems Laboratory – Cambridge, MA USA, 2020); Randolph Kirchain, Richard Roth et al., *Financial Model Updates Polymetallic Nodules online: https://isa.org.jm/files/files/documents/MIT_0.pdf* (2020).
[106] For access to the documents, see: https://isa.org.jm/files/files/documents/MIT_0.pdf and https://www.isa.org.jm/wp-content/uploads/2022/12/Nodule-Financial-Payment-System-Report-October-2020-V3.pdf.
[107] Kirchain, Roth, et al, UPDATE *supra* note 105 at 4.
[108] *Ibid* at 5.
[109] ISA, "Comments on Refining Assumptions of the Financial Model" (April 2020) online: https://www.isa.org.jm/wp-content/uploads/2022/12/assumptions-tab_0.pdf.

corporate income taxes to some Sponsoring State. One comment indicated that 0% and 15% Sponsoring State tax rates should also be investigated.

The comments asked the researchers for two important changes to the financial model. First, to address how results would be affected if costs were assumed to be 20% higher (or lower) than the current model, and second, to change the current assumptions of collecting the environmental fund as the model does not reflect the total project level externality costs of extraction. Stakeholders suggest aligning fund value with total externality costs, possibly even before collection operations begin.[110] The MIT Group shifted away from defining project acceptability based on contractor return and instead favoured the revenue received by the ISA, which reduced the profitability from 17% to 12%.[111] MIT Group concluded that a payment system is based on a variable ad-valorem variable rate.[112] There are significant gaps, and the MIT Group assumed that nodule value is based on four metals, including a mixture of manganese and other metals.[113] They conclude:

> Next steps are to set the details of the implementation of the royalty systems. There are many ways in which an ad-valorem system could be implemented. The basis of value could be the ore, the metal contained in the ore, the net-smelter revenue, and others. The research team strongly believes that for an initial implementation of a payment system the value basis should be a transparent, internationally available price index and should not require collecting information from stakeholders outside of ISA jurisdiction. The ISA needs to establish exactly which price indices will be used, how will the quantity of nodules removed be reported, what will be the schedules, reporting and specific techniques used for the assaying of nodules removed from the seabed, and the frequency of the royalty payment calculation.[114]

The MIT group is asking the ISA for a procedure for valuing mineral assets. Considering that other consultants have indicated that current measures grossly overvalue the minerals on the seafloor, a seabed mineral asset valuation code becomes more important. It becomes paramount

[110] *Ibid* at 6. Note how prefeasibility occurs before the exploitation contract is granted.
[111] Kirchain, Roth, et al., UPDATE, *supra* note 105 at 4.
[112] *Ibid* at 19.
[113] *Ibid* at 19.
[114] *Ibid* at 19.

considering that the ISA and other consultant reports (including the MIT Group) have not included environmental costs in the financial analysis.[115] The African Group notes that:

- None of the ISA contracts held are sponsored by an African country,
- A very low royalty of 2-4% combined with no project share has been proposed,
- The latest *Draft Exploitation Regulations* provide that non-developed State contractors could be financially incentivized to mine,
- Little time has been spent on considering how to maximize participation by developing States,
- Little time has been spent on assisting the adverse impacts of exploitation in the Area on a developing country,
- The African Group notes that the Enterprise is the only mechanism by which most developing States can participate in activities.[116]

Definitional problems have also allowed TMC to make claims in their public disclosure documents. They assert that royalty will be calculated on an ad valorem basis in calculating royalties.[117] All TMC's filings use a 0% corporate tax rate, while their consultant uses a 20% corporate tax rate.[118] TMC is subject to Canadian federal and provincial tax for the estimated assessable profit of 27.00%.[119] TMC made some important assumptions, including generating a rate of return of 27% and mining 1.7 Mt annual tonnes of ore, with cost estimates of $33/dry tonne for royalties. They also assume a 95% recovery of nickel at an assumed price of nickel metal of $16,472/tonne, an 86% recovery of copper at an assumed price of $6,872/t copper

[115] CRU Consulting, *Polymetallic nodule valuation A report for the International Seabed Authority*, CRU Reference: C-07177 (2020) at 2; Koji Goto et al, *Preliminary Economic Feasibility Analysis of Cobalt-Rich Manganese Crust Mining for Rare Metal Recovery* (Proceedings of the International Conference on Offshore Mechanics and Arctic Engineering – OMAE, 2010).
[116] Peoples Republic of Algeria, *Request for consideration by the Council of the African Groups proposal for the overutilization of the Enterprise, Doc No. MPANY/N04/MR18 (July 2018)*.
[117] AMC, *Canadian NI 43-101 Compliant TOML Clarion-Clipperton Zone Project Mineral Resource Estimate*, (March 2016); TMC Investor presentation, (2022) at 6; TOML, *supra* note 5.
[118] AMC, Technical Report Summary: *TOML Mineral Resource, Clarion Clipperton Zone*, filed In accordance with the requirements of SEC Regulation S-K (subpart 1300) AMC Project 321012 (26 March 2021); AMC, *Life of mine model based on Canadian NI 43-101 Compliant Preliminary Economic Assessme*nt (PEA) for NORI-D Area (AMEC: February 2021). AMC used an older DeepGreen's analysis of tax treatment of future revenue streams; AMC is not an expert in tax affairs; AMC Consultants, *Technical Report Summary, Initial Assessment of the NORI Property, Clarion-Clipperton Zone.* made in accordance with the requirements of SEC Regulation S-K (subpart 1300) AMC Project 321012 (London, 2021); AMC Consultants, *Technical Report NORI Area D Clarion Clipperton Zone Mineral Resource Estimate* AMC Project 318010 (Brisbane: Australia, 2019);
[119] TMC had no assessable profit in Canada for all periods disclosed. There is also tax issues with the TOML acquisition. The deferred tax liability is recognized due to the difference between the book value and the tax basis of the acquired assets as part of the TOML Acquisition.

metal, a 77% recovery of cobalt at an assumed price of $46,333/t cobalt metal, and a 99% recovery of manganese.[120] These numbers are significantly higher than the MIT Group's studies and analyses and far above other consultant conclusions, except for the amount of recovered minerals, which is significantly lower.[121] The SEC also takes issue with TMC's forecasts:

> We note your price estimate forecasts were provided by CRU International Limited. Please disclose the preparation date for this market report and explain, with particularity, your reasons for using the selected prices, including the material assumptions underlying those price selections. This explanation must include disclosure of the time frame used to estimate the commodity price and unit costs for cut-off grade estimation and the reasons justifying the selection of that time frame.[122]

TMC acknowledged the SEC's concerns and added better disclosure on these assumptions as they were based on *in situ* values.[123]

In November 2022, the sixth session of the Open-ended Working Group on the Financial Terms of a Contract reviewed an updated financial analysis by the MIT Group.[124] The model introduced the influence of Sponsoring State tax and recommended adopting a two-stage payment system with a variable ad valorem to maximize ISA revenue and reduce risk. There remain issues regarding implementing a Sponsoring State tax into the model, as there are concerns that some contractors may not pay this tax and would, therefore, require alternative royalty rates.

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[120] Prices of these metals on 2 January 2022 are 3.80/lb. for copper, nickel is 13.80/lb., 23.25 for cobalt, and 4.09/dmtu see: Mining.com "Home Page" online: https://www.mining.com/ (accessed 2 January 2023).
[121] Goto et al, *supra* note 115; CRU Consulting, *supra* note 115; CRU Consulting & RMG Consulting *Joint summary of the reports prepared by CRU and RMG Consulting relating to a Comparative Analysis of the Financial Aspects of Seabed Mining and Land-Based Mining* (2020); Kirchain & Field, UPDATE *supra* note 105.
[122] SEC, *Letter to SOAC Re: Sustainable Opportunities Acquisition Corp. Registration Statement* on Form S-4 Filed April 8, 2021 File No. 333-255118 (2021) at 3; SOAC, *Letter to SEC re Registration Statement on Form S-4* filed April 8, 2021; *Part 229—Standard Instructions for Filing Forms Under Securities Act of 1933, Securities Exchange Act of 1934 and Energy Policy and Conservation Act of 1975* at Item 601 paragraph (96)(iii)(b)(11)(iii)..
[123] See ISA Reporting Standard, *infra* and Chapter 4, *supra*.
[124] ISA, *Statement by the President of the Council on the work of the Council during the third part of the twenty-seventh session* ISBA/27/C/21/Add.2 (14 December 2022) online: https://www.isa.org.jm/wp-content/uploads/2023/03/2228629E.pdf; MIT Group, *Financial Payment System Modeling for Polymetallic Nodules* Presentation to International Seabed Authority Open Ended Working Group on Financial Modeling (7 November 2022) online: https://www.isa.org.jm/wp-content/uploads/2023/03/Financial_Model_November_2022.pdf.

5.1.3 Environmental Costs

From an environmental perspective, the 2018 MIT report included direct costs and revenues arising from mining and processing nodules, some costs of environmental baseline studies, and individual assessment and monitoring costs directly associated with mining operations.[125] For example, the authors included a token amount for a seabed environmental compensation fund. They stated this is "indicative until a substantive discussion of the individual components has occurred. It is included in the model to reflect the economic impact of such instruments and how they affect the operation's profitability."[126]

Neither MIT study considered any costs of environmental damage.[127] The authors confirmed, "at present, all direct costs do not consider any costs for environmental restoration as there is currently no explicit obligation to do so."[128] The authors continued, "the failure to include externality costs should not be construed as an assertion that these costs are unimportant. Instead, the authors hope that the information on expected direct costs (and revenues) presented here will ultimately be compared to estimates of externality costs."[129] In other words, they acknowledge the need for better inclusion of environmental factors in the analysis. They continue: "we cannot assure you that any such royalties or levies will not be greater than those discussed and could be significantly greater."[130]

These omissions are problematic. The calculations for the contribution to the environmental fund should reflect the cost of maintaining a range of financial instruments, including the Environmental Performance Guarantee, insurance, and an Environmental

[125] Kirchain et al, *supra* note 80 at 10.
[126] ISA, Briefing Note, *supra* note 88.
[127] Kirchain et al, *supra* note 80 at 10.
[128] *Ibid*.
[129] *Ibid* at 11.
[130] *Ibid*.

Compensation Fund. Environmental degradation (even to the smallest degree), an example of a negative externality, will be unavoidable. Given the environmental consequences of seabed mining being largely unknown, they remain unquantifiable at this stage, and the environmental impact cost to society is a major unknown variable.[131]

The *Draft Exploitation Regulations* provide for periodic review of the system and the rates of payments in light of changing circumstances.[132] This review may include adjusting the royalty rate and the manner and basis of a royalty calculation.[133] However, the 2020 MIT update report did not include environmental externalities:

> This analysis does not attempt to estimate the externality costs (impact on ecosystem services, biodiversity, resource waste) associated with the mining activity. Notably, in not estimating this cost, the financial analysis carried out to date (including that presented in this update) do not internalize this cost. Analysis of these externality costs is beyond the study's scope and the resources available to the research team.[134]

In addition to not including externality or environmental costs, the model did not consider social discounts or the Common Heritage of Mankind. The authors admit that:

> While a payment system with very high royalty rates could conceivably provide very large revenues, if those rates are too high (and the extracted payments too large), a seabed mining operation would not be financially attractive for any contractor. The challenge is, therefore, to find the system that provides the high return to the CHM while providing sufficient financial motivation to potential contractors. (It is important to note again that this analysis does not answer the question as to whether any given level of compensation to the CHM is sufficient.). Previously, the research team has tried to identify "sufficient financial motivation" solely in terms of the rate of return expected for the contractor.[135]

Finally, the authors admit that tax rates were not properly calculated:

> stakeholders have pointed out that previous agreements surrounding the royalty rates have stipulated: "the rates of payments under the system shall be within the range of those prevailing in respect of land-based mining of the same or similar minerals in order to avoid giving deep seabed miners an artificial competitive advantage or imposing on them a competitive disadvantage." In light of this, the ISA has commissioned a report authored by RMG consulting to benchmark the royalty rates typically charged for mining cobalt, copper, nickel, and manganese. This report recommends that ISA consider royalties in the range of 2-10% of value. Although, it does not specify whether this applies to metal value or the value of the contained ore.[136]

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[131] Kris Van Nijen, Steven Van Passel & Dale Squires, "A stochastic techno-economic assessment of seabed mining of polymetallic nodules in the Clarion Clipperton Fracture Zone" (2018) 95 Marine Policy 133.
[132] *Draft Exploitation Regulations*, *supra* note 62 at Regulations 81, 82, 107.
[133] *Ibid* at Regulation 81(3).
[134] Kirchain, Roth, et al., UPDATE, *supra* note 103 at 3.
[135] *Ibid* at 7.
[136] *Ibid* at 8.

Again, *in situ* metal value is not an acceptable revenue calculation method under securities laws in Canada and the United States.[137] Finally, processing was not factored into the analysis:

> Stakeholder feedback highlighted that the metallurgical processor may not extract a mix of manganese metal and alloys as have previously been assumed. Instead, it may be the case that metallurgical processors will extract cobalt, copper, and nickel and a manganese containing product that is sold for a value similar to manganese ore. As has been discussed in previous reports and presentations, while the metallurgical processor sits outside of the jurisdiction of the ISA, it plays an important role is setting the overall revenues that flow into the system. If metallurgical processor revenues are lower, then they will pay less for nodules. In turn, this makes revenues to the collector go down.[138]

The November 2022 MIT Group update model did not consider environmental valuations or externalities.[139] Thus, costs may be underestimated, and profitability overestimated in all of these models. Furthermore, any environmental performance guarantee, environmental compensation fund, or insurance would reduce profit. Issues with the Common Heritage of Mankind, the different grades and quality of ore, the different extraction expenses, the varying distances to the processing market, and the differences in contractor cost bases, among others, all contribute to the problems with setting appropriate royalty rates. They have not been solved as of the date of writing.

5.2 The ISA and Valuation

How the ores found on the seabed are valued is critical, and a mineral asset valuation code would assist the ISA in this regard. A short discussion follows on the work conducted by the ISA on measuring and valuing minerals, including Plans of Work, mining workplans, the recommended reporting standard and the potential inclusion of a social discount rate. Under the *Draft Exploitation Regulations*, a royalty return shall include the following for each royalty period:

- The quantity in wet metric tons of mineral-bearing ore recovered from each Mining Area,
- Quantity and value by mineral in wet metric tons of the mineral-bearing ore shipped from the Mining Area,
- Value and the basis of the valuation of the mineral-bearing ore sold or removed without sale from the Mining Area, as verified by a suitably qualified person and supported by a representative chemical,
- Details of all contracts and sale agreements relating to the mineral-bearing ore sold or removed and

[137] See Chapter 4, *supra*.
[138] Kirchain, Roth, et al., UPDATE, *supra* note 103 at 9.
[139] Kirchain et al., November 2022 UDPATE, *supra* note 124.

- A calculation of the royalty payable.[140]

Draft Regulation 78 aims to ensure that where any costs, prices and revenues have not been charged or determined on an arms-length basis under a contract or transaction between a contractor and a related party, the ISA may adjust the value of such costs, prices, and revenues to reflect an arms-length value. These principles and standards for royalties are not yet developed. In other words, valuation principles have not been developed. The ISA has developed mining workplans and a reporting standard based partially on CRIRSCO.

5.2.1 Plans of Work and Mining Workplans

The purpose of a plan of work is for the applicant contractor to demonstrate that its proposed exploitation activities will comply with UNCLOS, the *1994 Agreement*, the *Mining Code* (which includes the *Draft Exploitation Regulations,* related *Standards and Guidelines)*, national laws, regulations and administrative measures of the Sponsoring and Processing State(s), and the terms of the contract with the ISA.[141] Draft Exploitation Regulation 13 contains the details for the plan of work. The ISA shall determine if the applicant has or can demonstrate that it will have the financial and technical capability to carry out the plan and to meet all obligations under an exploitation contract and has demonstrated the economic viability of the mining project.[142] Information provided includes the necessary details that the applicant will be capable of committing or raising sufficient financial resources to cover the estimated costs of the proposed exploitation activities and all other associated costs of complying with the terms of any exploitation contract, including the payment of any applicable fees and other financial payments

[140] *Draft Exploitation Regulations*, *supra* note 62 at Regulation 71.
[141] *Draft guidelines on the preparation and assessment of an application for the approval of a Plan of Work for exploitation* ISBA/27/C/3 (21 March 2022) at Para 2; *Draft Exploitation Regulations*, *supra* note 62 at Regulation 7.
[142] *Draft Exploitation Regulations*, *supra* note 62 at Regulation 13, Annex I, Section IV.

and charges, the estimated costs of implementing the Environmental Management and Monitoring Plan and the Closure Plan, and access to insurance products.[143]

If a State or a State Enterprise makes the application, the State must certify that the applicant has the necessary financial resources to meet the estimated costs of the proposed plan of work. Corporate entities must attach copies of their audited financial statements, including balance sheets, income, and cash flow statements. If the applicant is a newly organized entity and a certified balance sheet is not available, a certified *pro forma* balance sheet must be included. Applicants that are subsidiaries of another entity (such as NORI) must attach copies of the financial statements of the parent entity and a statement from the parent entity that the applicant will have the financial resources.[144] Where an applicant seeking approval of a plan of work intends to finance by loans or other types of borrowing, they must attach details of the amount of such borrowing, the repayment period, and the interest rate, together with the terms and conditions of any security, charge, mortgage or pledge made or provided or intended to be made or provided or imposed by any financial institution in respect of such borrowing.[145]

The plan of work includes guidance regarding the publication and public consultation on Environmental Plans (Environmental Impact Statement, Environmental Management and Monitoring Plan, and Closure Plan).[146] Plans of work must be demonstrated by a Pre-Feasibility Study or Feasibility Study showing the technical and economic viability of the proposed project.[147] Such studies must demonstrate that extraction is financially, technically, and environmentally justified and must be prepared following Good Industry Practice and

[143] *Ibid* at Regulation 13(2).
[144] *Ibid* at Annex I, s. 14(21).
[145] *Ibid* at Annex I, s. 14(22); Draft Plan of Work Guidelines, *supra* note 141.
[146] *Ibid* at Annex I, s. IV (21).
[147] *Recommendations for the guidance of contractors on the content, format and structure of annual reports*, by ISA, ISBA/21/LTC/15 (Kingston, Jamaica: ISA, 2015) ("ISA Reporting Standard").

Guidelines.[148] Therefore, the *Draft Plan of Work Guidelines* should be drafted to determine if the applicant can commit to or raise sufficient financial resources to cover all costs, including the estimated costs of implementing the Environmental Management and Monitoring Plan and the Closure Plan, and access to appropriate insurance products.[149]

Annex II requires a contractor to create a mining workplan.[150] A Mining Workplan includes a comprehensive statement of the Mineral Resource (as defined previously), including details or estimates of all known Mineral Reserves, reported following the *Reporting Standard for Reporting of Mineral Exploration Results Assessments, Mineral Resources and Mineral Reserves,*[151] together with a comprehensive report that includes details of and validation of the grade and quality of the possible, proven and probable ore reserves, as supported by a pre-feasibility study or a feasibility study.[152] The Mining Workplan includes a detailed production plan, showing the anticipated production schedule, the estimated maximum amounts of minerals produced each year, and an economic evaluation and financial analysis of the project.[153] It includes technically and economically justified estimates of the period required for exploitation and an economic evaluation and financial analysis of the project.[154]

Financial information is explicitly not included. This is problematic as environmental impacts could add significant costs to an operator. The Belgian contractor Global Sea Resources NV acknowledges that there is a need for additional research on critical metrics and key cost

[148] *International Mineral Property Valuation Standards Template 4th Ed.* (IMVAL, 2021) at Part 7; CRIRSCO *International Reporting Template for the public reporting of Exploration Targets, Exploration Results, Mineral Resources and Mineral Reserves* (ICMM, 2019); *CIMVAL Code for the Valuation of Mineral Properties*, (CIMM 2019).
[149] The ISA is mandated to create an insurance Guideline, but at the date of writing, has not done so.
[150] *Draft Exploitation Regulations*, *supra* note 62 at Annex II.
[151] ISA Reporting Standard, *supra* note 147 at Annex V.
[152] *Draft Exploitation Regulations*, *supra* note 62 at Annex III, s. 1.
[153] ISA Reporting Standard, *supra* note 147 at Annex III(g).
[154] *Ibid.*

drivers, such as project phases (pre-feasibility, feasibility, construction), mine life, nodule content, and metal extraction scenarios.[155] TMC succinctly states, "there are no environmental provisions due to the absence of a regulatory framework. The affected area cannot be quantified yet."[156] *Draft Plan of Work Guideline* improvements are required.

5.2.2 The ISA's Reporting Standard

As detailed earlier, the ISA's Reporting Standard is based on the Committee for Mineral Reserves International Reporting Standards ("CRIRSCO").[157] The ISA has partially adopted CRIRSCO standards but has not adopted any valuation codes. After discovery, a mineral deposit will be subject to further studies to estimate its size. According to CRIRSCO and the ISA Reporting Standard, a deposit may be defined as a "mineral resource," which is a concentration or occurrence of solid material of economic interest in or on the Earth's crust in such form, grade or quality and quantity that there are reasonable prospects for eventual economic extraction.[158] The ISA Reporting Standard requires the classification and reporting of a mineral deposit based on the available geological data and associated technical studies.[159]

According to this ISA Reporting Standard, a deposit is defined as a "mineral resource" if there are reasonable prospects for eventual economic extraction.[160] Measured mineral resources may be converted into probable mineral reserves because of uncertainties associated with some or all the modifying factors in converting mineral resources into mineral reserves.[161] Portions of a mineral deposit that do not offer reasonable prospects for eventual economic extraction must

[155] Global Sea Mineral Resources, *supra* note 74.
[156] AMC Consultants, *supra* note 118.
[157] ISA Reporting Standard, *supra* note 147 at 5, Annex.
[158] *Ibid* at 26.
[159] *Ibid* at Annex 5. See Chapter 4, *supra* for a detailed discussion of mineral asset valuation codes.
[160] *Ibid* at 24.
[161] *Ibid* at 25.

not be included in a mineral resource.[162] The ISA Reporting Standard requires that the classification and reporting of a mineral deposit must be based on the geological data available and associated scientific and technical studies. Mineral resources must not be aggregated with mineral reserves. The scientific challenges involved are acquiring the necessary data and systematically processing and analyzing the data to establish a resource estimate that meets the standard. However, the ISA Reporting Standard does not link to any financial requirement, as do the mineral asset valuation codes. A mineral reserve is the economically mineable part of a measured or indicated mineral resource.[163] Mineral reserves are those portions of mineral resources that, after applying all mining factors, result in an estimated tonnage and grade, which, in the opinion of the contractor making the estimates, can be the basis of a viable project.[164]

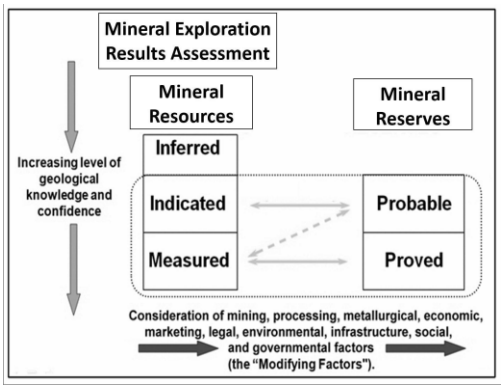

Figure 1: Classification of mineral resources based on the general relationship between mineral exploration results assessment, minerals resources and mineral reserves.[165]

The ISA Reporting Standard details requirements for nodules, sulphides, and crusts. For all three types of deposits, the main parameters for a resource estimate are the area of the deposit,

[162] *Ibid* at 26. The guidance notes add that Mineralization may be classified as a measured mineral resource when the nature, quality, amount and distribution of data are such as to leave no reasonable doubt, in the opinion of the contractor determining the mineral resource, that the tonnage and grade of the mineralization can be estimated to within close limits, and that any variation from the estimate would be unlikely to affect significantly. potential economic viability.
[163] *Ibid* at 30; CRIRSCO, *International Reporting Template* (ICMM, 2019) at 25.
[164] *Ibid* at 31.
[165] *Ibid* at Annex V.

the volume, and data for characterization of the ore (e.g., mineralogy, density, metal grades).[166] Estimating the resources in nodule deposits requires knowledge of the total area and reliable averages for the nodules' composition and spatial abundance.[167] Cobalt crust mineral characterization may only be acquired by drilling or cutting, which is unsuitable for covering a large area.[168] The lack of technology for efficiently producing representative thickness maps of the crusts hinders resource estimation.[169] Calculating the resources of sulphide deposits requires establishing the depth of mineralization and determining ore characteristics, which is accomplished by core drilling.[170] Seafloor core sulphide drilling has proven exceedingly difficult, and as of the time of writing, no one has conducted such a study.[171]

5.2.3 Comparison of Reporting Standard and Mineral Asset Valuation Codes

There are similarities with the ISA Reporting Standard, CRIRSCO and valuation codes. CRIRSCO, as described earlier, reports on mineral resources and reserves and uses the same terminology as valuation codes. The ISA Reporting Standard requires that all the modifying factors and pre-feasibility or feasibility studies be conducted before determining the mineral reserves.[172] The pre-feasibility or feasibility study will need to determine whether a mine plan is technically achievable and economically viable.[173] A contractor must disclose any relevant information concerning a mineral deposit that could materially influence the economic value of

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[166] *Ibid*.
[167] T. Kuhn, & C. Rühlemann, "Exploration of Polymetallic Nodules and Resource Assessment: A Case Study from the German Contract Area in the Clarion-Clipperton Zone of the Tropical Northeast Pacific" (2021) 11 *Minerals* 618.
[168] *Ibid.*
[169] *Ibid;* Volkman, *supra* note 11.
[170] Volkmann, *supra* note 11; Rozemeijer et al, *supra* note 7; Banet, *supra* note 12.
[171] Blue Nodules*, Deliverable Report - D2.1 Design Requirement Report for Subsea Harvesting Equipment*, by (2016); Blue Nodules*, Deliverable Report - D2.2 Initial Design of Nodule Collector and Collector Test Performance* (2016); Blue Nodules, *Deliverable report - D1.1 Terms of Reference* (2017); Blue Nodules, *Deliverable report - D2.11 CCZ Design report for prototype mining* (2020).
[172] ISA Reporting Standard, *supra* note 147 at 30.
[173] *Ibid* at 51.

that deposit to the contractor.[174] A contractor must promptly report any material changes in its mineral resources or reserves to the ISA.[175] Reports on mineral exploration results assessments must not be presented to unreasonably imply that mineralization of potential economic interest has been discovered.[176]

The ISA Reporting Standard is materially different from mineral valuation codes. The ISA Reporting Standard sets out the criteria to be observed in all documents submitted to the ISA, including the reporting of estimates of resources in the Area that are not intended for public release or for the prime purpose of informing investors or potential investors and their advisors.[177] Mineral exploration results assessments include data and information generated by mineral exploration programmes that might be useful to readers of the report but do not form part of a declaration of mineral resources or mineral reserves.[178] On the other hand, mineral valuation codes aim to inform regulators and investors through public disclosure of information.

Further, there are only two principles used in the ISA Reporting Standard. They are transparency and materiality.[179] As described in the previous chapter, CIMVAL uses six principles: competence, materiality, reasonableness, transparency, independence, and objectivity.[180] The overriding principles of the VALMIN Code are materiality, competence, and transparency.[181] Collectively, these principles ensure that all material information is presented by an appropriately qualified expert, free of bias or influence, whose work and conclusions can be clearly understood and reproduced to verify their calculations. The process and public report

[174] *Ibid* at 25.
[175] *Ibid* at 25.
[176] *Ibid* at 26.
[177] *Ibid* at I(1), 4.
[178] *Ibid* at 25.
[179] *Ibid* at II(3).
[180] CIMVAL, *supra* note 148 at s 2.1.
[181] *Australasian Code for Public Reporting of Technical Assessments of Mineral Assets* (the VALMIN Code) 2015 Edition (AusIMM, 2015) at Part 3.

must be as transparent, objective and rigorous as the available data and other material information. Valuators must be satisfied that they can face their professional peers and demonstrate competence in the valuation undertaken. Valuators should assess their competence regarding the subject Mineral Property, the market in which the property would trade, and the purpose of the valuation. The valuation of Mineral Properties may require competence in a wide range of disciplines. A valuator who is not competent in all aspects of a valuation assignment must seek assistance from one or more experts.[182] The valuator must form an opinion that is reasonable in the circumstances, that is, what they objectively believe is rational and plausible and would be viewed as such if considered by other appropriately qualified and experienced experts. Valuation requires the valuator to make impartial judgements regarding the reliability of inputs and assumptions.[183] The current risk is that valuators are overestimating how many nodules are on the seafloor and greatly exaggerating the revenues from these nodules.[184] This risk is explored later in this dissertation.

Additionally, the ISA Reporting Standard has no technical valuation requirements. The ISA Reporting Standard states that there is no definition for the term "economically mineable."[185] However, it is expected that companies will attempt to achieve an acceptable return on the capital invested and that returns to investors in the project will be competitive with alternative investments of comparable risk.[186] The only financial advice provided is contained in Enclosure 1, which states that cost and revenue factors include assumptions about projected capital and the operating costs, assumptions made regarding revenue, including head grade,

[182] *CIMVAL*, *supra* note 148 at 5.
[183] *Ibid* at 9.
[184] CRU Consulting, *supra* note 115; CRU Consulting & RMG Consulting, *supra* note 121; SEC, *supra* note 122.
[185] ISA Reporting Standard, *supra* note 147 at 30.
[186] *Ibid* at 50.

metal or commodity prices, exchange rates, transportation and treatment charges, penalties, allowances made for royalties payable, international benefit sharing.[187] CIMVAL, Regulation S-K, and VALMIN are designed to guide valuation and have guidance on valuing minerals. The ISA's requirements are less stringent and contain no valuation guidelines.

Further, gross *in situ* values are allowed. The ISA Reporting Standard defines the valuation of mineral-bearing ore as the value of the mineral-bearing ore shall be an assumed gross value per metric ton.[188] The assumed gross value shall reflect the summation of each metal contained in the mineral-bearing ore.[189]

The ISA Reporting Standard does not imply that an economic operation should have proven mineral reserves.[190] Cases may arise where probable mineral reserves alone may be sufficient to justify extraction.[191] The term "mineral reserves" in the ISA Reporting Standard need not necessarily signify that extraction facilities are in place or operative or that all necessary approvals or sales contracts have been received.[192] Without legal regulations, high production requirements and below-expected mining rates could foster cherry-picking only the favourable parts of a deposit, not utilizing the mineral resources.[193] The ISA Reporting Standard does not require a final feasibility study to have been undertaken to convert mineral resources into mineral reserves. It does require that studies to at least pre-feasibility level have determined a mine plan

[187] *Ibid* at Enclosure 1.
[188] This approach towards determining a reference value applies to polymetallic nodules only. Whether this approach is appropriate for other mineral resource categories remains open for discussion.
[189] *Draft Exploitation Regulations*, *supra* note 62 at Annex IV.
[190] ISA Reporting Standard, *supra* note 147 at 31.
[191] *Ibid* at s. 54.
[192] *Ibid* at 30.
[193] Volkmann, *supra* note 11 at 51; TMC picked the best 7 km by 7 km part of NORI-D, while not conducting any research on many other parts of the area.

that is technically achievable and economically viable.[194] This requirement is less stringent than CIMVAL and VALMIN but aligns with the updated SEC Regulation S-K.

Despite these deficiencies (and other environmental deficiencies noted below), the ISA Reporting Standard improves mineral asset valuation codes in one aspect. Enclosure 1 contains a detailed checklist for those preparing reports on mineral exploration results assessments, mineral resources, and reserves. It includes sampling techniques, estimation and modelling techniques, and classification criteria.[195]

5.2.4 The ISA Reporting Standard and the Social Discount Rate

There are no environmental or social considerations in the ISA Reporting Standard. The only reference to the environment is contained in the "Other" category in Enclosure 1, which states that a contractor should report on the effect, if any, of natural risk, infrastructure, environmental, legal, marketing, social or governmental factors on the likely viability of a project and the estimation and the classification of the mineral reserves.[196] The Mining Code requires environmental impact assessments, environmental impact statements, environmental baseline studies and other environmental reports; however, they are not included in, nor aligned with, the ISA Reporting Standard. TMC, in their Regulation S-K filing for their Tongan operations, notes that "other contributors towards optimum benefit will come from the metal produced and many environmental and social benefits by sourcing the metal from a more sustainable operation. This benefit should be recognized as a significant part of the Common Heritage of Mankind."[197]

[194] ISA Reporting Standard, *supra* note 147 at 40.
[195] *Ibid* at Enclosure 1.
[196] *Ibid* at 41.
[197] AMC, TOML Estimate, *supra* note 5.

In July 2020, the ISA suggested that an expert study establish a justifiable and appropriate social discount rate.[198] A social discount rate would reveal the present value of future income as a society. A lower social discount rate signals that costs and benefits that occur in the future are valued more than the present.[199] A key question in the choice of social discount rate is the intergenerational equity impacts of policies with intertemporal benefits and costs.[200] Wakefield and Myers used a benefit-cost framework to analyze the social costs and benefits of seabed mining in the Pacific Island Region.[201] They concluded that seabed mining might increase the well-being in some areas but is unlikely to improve the well-being of most developing small island States.[202]

The resulting report released in September 2020 showed that the present value of this flow of royalties represents a measure of the resource wealth associated with the Common Heritage of Mankind managed by the ISA, and this rate should be internalized into all financial models.[203] Freeman et al. used a "normative" approach to social discounting, which arrives at the social discount rate by analyzing the welfare and consumption sides of the economy and the trajectory of economic growth in consumption.[204] The alternative approach would be a market-based approach. Academic experts and governmental bodies prefer the market-based approach to estimating the social discount rate. It has also been subject to several major criticisms, notably

[198] ISA, *Call for Proposal for a Study to Determine an Appropriate Social Discount Rate for the International Seabed Authority* (2020) at Terms of Reference para 4.
[199] Frédéric Cherbonnier & Christian Gollier, "Risk-adjusted Social Discount Rates" (2022) 43:4 The Energy journal.
[200] Helen Scarborough, "Intergenerational equity and the social discount rate" (2011) 55:2 The Australian journal of agricultural and resource economics 145.
[201] Jeffrey Wakefield & Kelley Myers, "Social cost benefit analysis for deep sea minerals mining" (2018) 95 Marine Policy 346.
[202] *Ibid* at 347.
[203] Mark Freeman, Ben Groom & Zachary Turk, *A Study to Determine the Appropriate Social Discount Rate for the International Seabed Authority* (University of York: ISA, 2020) at 4.
[204] *Ibid* at 7.

by Stern and Arrow.[205] The appropriate social discount rate for calculating the present value of the ISA revenue stream depends on the ISA's objective. The options are financial or welfare valuation. For financial valuation, a social discount rate is based on market rates. For welfare valuation, the rate should be based on fairness, inequality aversion, growth risks, revenue risk, and intra- and inter-temporal inequality.[206]

While the specific discount rate is up for debate, the point here is that setting a social discount rate that can incorporate intergenerational equity in policy analysis is a difficult but necessary addition to financial analysis.[207] The social discount rate can also be used in financial models as a proxy for environmental protection.[208] Discounting is criticized for being inconsistent with sustainable development.[209] Adding a social discount rate to the MIT models would diminish a contractor's profit, potentially rendering a project untenable. For example, the NORI-D technical data lacks any financial information.[210] No Mineral Reserve estimates for the NORI Area exist, as the preliminary economic analysis has not yet supported the potential viability of the Mineral Resources.[211]

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[205] K Arrow, et al. "Intertemporal equity, discounting, and economic efficiency" in J.P. Bruce & E. Haites, [eds] *Economic and Social Dimensions of Climate Change, Contribution of Working Group III to the Second Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press, 1996); K. Arrow, "Discounting, morality, and gaming" in *Discounting and Intergenerational Equity*, P. Portney and J.P. Weyant [eds] (Washington: 1999) at 6; N. Stern, "The Stern Review on the Economics of Climate Change" Cambridge University Press, 2007) at 18; N. Stern, "The economics of climate change" (2008) 98:2 American Economic Review 1.
[206] Freeman, Groom & Turk, *supra* note 203 at 10.
[207] *Ibid* at 3, 4, 14, 11; William Nordhaus, "A review of the Stern Review on the Economics of Climate Change" 45 (2007) Journal of Economic Literature 686; Scarborough, *supra* note 200 at 154, 155; K. Arrow, et al., "Are we consuming too much?" (2004) 18:3 Journal of Economic Perspectives 147.
[208] Colin Price, "Low discount rates and insignificant environmental values" (2010) 69:10 Ecological economics (Ecological Economics) 1895–1903.
[209] DW Pearce, G. Atkinson, & S. Mourato, *Cost-Benefit Analysis and the Environment: Recent Developments.* (OECD, Paris, 2006); DW Pearce, "Framework for assessing the distribution of environmental quality" in Serret, Y. and Johnstone, N. (eds), *The Distributional Effects of Environmental Policy (*Edward Elgar, 2006) at 23.
[210] AMC Consultants, *supra* note 118 at 156–159.
[211] *Ibid* at 129.

The ISA Reporting Standard does not assist in estimating the valuation of seabed mineral resources from an income approach, as the terms are sufficiently forward-looking and uncertain. Instead, calculating a social discount rate is the starting point for a broader discussion of the ISA's circumstances and objectives of finance, fairness, redistribution, intergenerational equity, climate change mitigation, biodiversity conservation, and the Common Heritage of Mankind. These issues are addressed as part of the analysis and recommendations. An integrated valuation code for seabed mining could incorporate these issues rather than the current ISA piecemeal approach of separating the environmental, social, and financial analysis. For example, Environmental Compensation Funds and Environmental Performance Guarantees are treated as separate and distinct from financial requirements.

5.3 Equitable Sharing

Concerning equitable sharing, the first issue is understanding which financial benefits will be shared.[212] A second core issue relating to equity is with whom sharing should occur. Article 140 provides that the benefits must be shared equitably but does not define "equitable."[213] The ISA assumes they do not plan on having a working sharing system until after exploitation begins, stating, "a key assumption, which is important for testing the models set out in the report, seabed mining has reached a stage where mining operations are underway in the Area, and a steady stream of payments is being made."[214]

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[212] ISA, *Rules, regulations and procedures on the equitable sharing of financial and other economic benefits derived from activities in the Area* ISBA/24/FC/4 (18 May 2018) online: https://equitablesharing.isa.org.jm/Documents/ISBA-24-FC-4-en.pdf at 3.
[213] *Ibid* at 4.
[214] ISA, *Development of rules, regulations and procedures on the equitable sharing of financial and other economic benefits derived from activities in the Area pursuant to section 9, paragraph 7 (f), of the annex to the Agreement relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982* Report of the Finance Committee ISBA/26/A/24–ISBA/26/C/39 (6 July 2021) online: https://equitablesharing.isa.org.jm/Documents/ISBA_26_A_24-2109788E.pdf at 3.

Equitable sharing of resource rents can be based on two possible rationales. The first is based on the concept of shared ownership. Equitable sharing can reflect a desire to redistribute income or wealth, for example, from wealthier to poorer States.[215] Both imply a redistribution of income or wealth relative to what would be required by a proportional distribution scheme based solely on ownership rights. UNCLOS Article 140 implies an underlying joint ownership rationale for equitable sharing. At the same time, however, Article 140 requires the ISA to consider the interests and needs of developing States and peoples who have not attained full independence or self-governing status, implying an income redistribution rationale. Article 82, although unrelated to mining in the Area, provides that payments or contributions are to be made by Coastal States in respect of the exploitation of the non-living resources of the continental shelf beyond 200 nautical miles. Those payments or contributions in kind are to be distributed by the ISA to developing States, particularly the least developed and the land-locked nations.[216]

5.3.1 Environmental Compensation Fund or a Seabed Sustainability Fund?

Environmental compensation funds should provide prompt, adequate, and effective remedies to those who have suffered damages in certain lawful activities, including property and environmental damage.[217] The *Seabed Advisory Opinion* identified a gap in the current wording of the law governing liability for environmental damage in the context of activities in the Area.[218] This gap could occur when a contractor incurs liability and is obliged to provide compensation but cannot fully meet its liability.[219] The ITLOS chamber suggested that, under

[215] *Ibid* at 6.
[216] *UNCLOS*, *supra* note 30 at Article 82.
[217] Guifang (Julia) Xue, *The Use of Compensation Funds, Insurance and Other Financial Security in Environmental Liability Schemes*, Report 6 (Waterloo, ON: CIGI, 2019) at 1.
[218] *Responsibilities and Obligations of States Sponsoring Persons and Entities with Respect to Activities in the Area* (Advisory Opinion), [2011] ITLOS Case No 17.
[219] *Ibid* at Para 203.

such circumstances, the ISA should consider establishing a fund to compensate for the damage not covered.[220]

Draft Exploitation Regulation 54 establishes the Environmental Compensation Fund ("the Compensation Fund") to implement necessary measures to prevent, limit or remediate any damage arising from activities in the Area, the costs of which cannot be recovered from a contractor or Sponsoring State.[221] It will also promote research into methods of marine mining engineering by which environmental damage or impairment resulting from exploitation activities may be reduced and create best practices for the restoration and rehabilitation of the Area. The third goal of the Compensation Fund is to restore and rehabilitate the Area when technically and economically feasible.[222] Funding will consist of a prescribed percentage or amount of fees paid, a percentage of any penalties paid, a percentage of any amounts recovered by the ISA as a result of legal proceedings in respect of a violation of the terms of an exploitation contract, monies directed to be paid into the Compensation Fund, and income received by the investments in the Compensation Fund.[223] Critical issues include guaranteeing State and contractor funding, interactions with insurance, determining which entities should contribute to the fund, and establishing institutional mechanisms to ensure efficient and effective management of those funds.[224]

In the absence of strict liability, operators can externalize the costs of measures taken to protect the environment.[225] Cost internalization may promote more efficient loss-sharing

[220] *Ibid* at Para 205, 209.
[221] *Draft Exploitation Regulations*, *supra* note 62 at Regulation 54(1).
[222] *Ibid* at Regulations 55, 56.
[223] *Ibid* at Regulation 56.
[224] ISA, "Briefing Note for the open-ended informal working group of the Council on the financial terms of contracts" (February 2019), at 4. Thompson et al, *supra* note 24.
[225] Neil Craik, *Determining the Standard for Liability for Environmental Harm from Deep Seabed Mining Activities*, CIGI Liability Series for Deep Seabed Mining - Report 2 (CIGI, 2018).

methods through insurance or compensation schemes, which spread the risk among operators and better protect against unfunded harm due to insufficient funds. No-fault regimes provide simplified dispute settlement processes as the claimant relieves the burden of proving fault.[226]

The ISA called for additional research on the Compensation Fund in February 2020.[227] The resulting ISA Technical Study 27 noted that the Compensation Fund has multiple purposes, including funding the implementation of any necessary measures designed to prevent, limit or remediate any damage, as well as funding research into marine techniques and best practices, education and training concerning the protection of the marine environment, and research into techniques for restoration and rehabilitation.[228]

In March 2021, the ISA released their Summary of options for a seabed sustainability fund.[229] The purpose of this fund is to provide funding for research into the best available techniques and best environmental practices for the restoration and rehabilitation of the Area and to provide for the restoration and rehabilitation of the Area and of the maritime zones of Coastal States when technically and economically feasible and supported by best available scientific evidence.[230] This fund would overcome two obstacles. First, the fund could overcome problems defining 'remediation,' 'restoration,' and 'rehabilitation' compared to 'reclamation' for land-based mining activity. Second, the fund would be used as an alternative to equitable sharing. This fund would include the social welfare function as a measure of an ethical judgment about the

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[226] *Ibid*.
[227] ISA, *Call for Proposals for a Study on an Environmental Compensation Fund in the Context of Exploitation of Minerals in the Area* (2020).
[228] ISA, *Study on an Environmental Compensation Fund for Activities in the Area*, Technical Study 27 (2021) at 4, 5.
[229] ISA, *Rules, regulations and procedures on the equitable sharing of financial and other economic benefits derived from activities in the Area pursuant to section 9, paragraph 7 (f), of the annex to the 1994 Agreement Summary on options for a seabed sustainability fund* ISBA/26/FC/8* (25 March 2021) online: https://equitablesharing.isa.org.jm/Documents/ISBA_26_FC_8-2104419E.pdf.
[230] *Ibid* at Annex, at 5.

appropriate distribution of revenues.[231] It could help reconcile the placeholder rates used in the MIT Group's study and the recommended applying a 3.75% social discount rate from Freeman et al.[232]

ISA Technical Study 31 investigated potential equitable sharing options to overcome this potential conflict.[233] The report presents the concept of a Seabed Sustainability Fund as an alternative or supplemental approach. A portion of the royalty revenue could be spent as it is collected, or a percentage share could be put into a fund invested in human, physical, financial and natural capital. The returns on that investment could then be used to finance consumption benefits to help delink disbursements from resource revenue.[234] Such a global fund could support public goods, human and physical capital investment, research, and conservation. This fund may or may not be the same as the required Environmental Compensation Fund.

During the 27th Session, held in July 2022, the ISA considered and supported the concept of a global seabed sustainability fund as an alternative or adjunct to the direct distribution of monetary benefits.[235] Many delegations stressed that the seabed sustainability fund must be distinct from the environmental compensation fund currently under consideration in the context of the draft regulations on mineral exploitation in the Area, whose purposes were completely different.[236] Some delegations also reiterated that the burden of the rehabilitation and restoration of the Area should rest with contractors.[237] Based on these discussions, it was agreed that the

[231] *Ibid* at 43.
[232] Freeman, Groom & Turk, *supra* note 203.
[233] ISA, *Equitable Sharing of Financial and other Economic Benefits from Deep-Seabed Mining*, Technical Report 31, (2021).
[234] *Ibid* at 27.
[235] ISA, *Item 6 of the provisional agenda: Rules, regulations and procedures on the equitable sharing of financial and other economic benefits derived from activities in the Area pursuant to section 9, paragraph 7 (f), of the annex to the 1994 Agreement*, 27th Session ISBA/27/FC/2 (13–15 July 2022).
[236] *Ibid* at 2.
[237] *Ibid* at 3.

ISA would formulate a more detailed proposal for establishing a seabed sustainability fund as an alternative or adjunct to the direct distribution of monetary benefits. This proposal, which should be presented at the Twenty-Eighth Session of the Assembly, will include recommendations on the objectives, purposes and governance of the fund, its governance on and appropriate mechanisms for performance evaluation and transparency in decision-making.[238] The recommendations provided on valuation in this dissertation could assist in creating environmental and sustainability funds as it provides the framework to value the seafloor assets.

5.3.2 Performance Guarantees

Environmental Performance Guarantees are intended to perform a different function than compensation funds.[239] Under the *Draft Exploitation Regulations*, a contractor shall lodge an Environmental Performance Guarantee ("Guarantee") in favour of the ISA no later than the production commencement date in the Mining Area.[240] The Guarantee is intended to reflect costs required for premature closure of exploitation activities, decommissioning and final closure of activities, including removing any installations and equipment and post-closure monitoring and management of residual environmental effects.[241] The Guarantee is restricted to the cessation of the mining activity and is not an instrument related to liability for environmental damage arising from a wrongful act.[242] There is no limit on the responsibility and liability of the contractor under its exploitation contract in the amount of such Guarantee.[243]

[238] *Ibid* at 4. The 28th Session is planned for 2024.
[239] Xiangxin Xu & Guifang (Julia) Xue, "The Environmental Compensation Fund: Bridging Liability Gaps in the Deep Seabed Mining Regime" (2021) 49:6 Coastal management 557–574.
[240] *Draft Exploitation Regulations*, *supra* note 62 at Part III, Regulations 26, 36.
[241] *Ibid*.
[242] *Ibid*.
[243] *Ibid* at Regulation 26, Annex I, s. 14(23).

The Guarantee was necessary after the Seabed Disputes Chamber noted gaps in 2011.[244] The gaps arise when the contractor is insolvent, or the Sponsoring State takes all necessary and appropriate measures required by the UNCLOS and the *Draft Exploitation Regulations*, but damage occurs; the Sponsoring State has failed to take the required measures or where failure is not causally linked to the environmental harm.[245] The ITLOS noted that obligations are to take measures to ensure the provision of guarantees in the event of an emergency order by the ISA for the protection of the marine environment, the obligation to ensure the availability of recourse for compensation in respect of damage caused by pollution, and the obligation to conduct environmental impact assessments.[246] The ISA believes that a balanced approach should be taken between environmental concerns and the need to ensure the development of activities in the Area.[247] Such balance includes ensuring that the form and amount of the Guarantee do not hinder the ability of contractors to participate and ensuring that the ISA has the full amounts required to cover the costs of environmental events.[248]

The *Draft Standard and guidelines on the form and calculation of an Environmental Performance Guarantee* assert that a contractor shall satisfy the ISA that it will meet the obligations by adopting an independently validated method and calculation for all costs, expenses and liabilities of the guarantee's scope.[249] The contractor shall maintain a sufficient guarantee for the life of the exploitation contract, and in some circumstances, beyond the terms

[244] *Seabed Advisory Opinion*, *supra* note 218.
[245] *Ibid*.
[246] *Ibid* at paras 122, 236.
[247] ISA, *Call for Proposals to Undertake a Study and Draft Standards/Guidelines for the Form and Calculation of an Environmental Performance Guarantee* (Kingston, Jamaica: ISA, 2020).
[248] *Ibid*.
[249] *Draft standard and guidelines on the form and calculation of an Environmental Performance Guarantee developed by the Legal and Technical Commission, ISBA/27/C/10 (31 January 2022) online: https://isa.org.jm/files/files/documents/ISBA_27_C_10-2117337E.pdf*.

of the exploitation contract.[250] The Guarantee is not to cover ordinary and foreseen operating costs, such as the costs of compliance with contractual conditions or tortious liability for environmental damage.[251] Other mechanisms, including contractor liability, compensation funds and insurance, will be used to compensate for tortious liability.[252] Rather, the Guarantee is intended to cover unexpected costs, expenses and liabilities that a contractor cannot meet.[253] Liabilities include reasonably estimable costs, such as costs associated with the closure plan and undertaking post-closure monitoring and management of residual environmental effects.[254]

According to the *Draft Standard and Guideline*, an Applicant shall propose a Guarantee by estimating costs, expenses and liabilities using an accepted calculation tool and producing a validation statement prepared and signed by an independent validator.[255] However, the ISA does not endorse any cost estimation tool for calculating the Guarantee.[256] Instead, a contractor may use any reasonable cost estimation tool, provided it suits the contractor's proposed operations.[257] A contractor has full discretion to determine the form of the Guarantee or combination of forms to suit their specific requirements, provided the form or combination of forms covers the maximum Guarantee calculated.[258] There are several forms recommended. The Guarantee can involve a self-guarantee or company guarantee.[259] A self-guarantee is based on evaluating the assets and liabilities of the contractor and its ability to pay the total rehabilitation and closure

[250] *Ibid* at s. 6.
[251] *Ibid* at s. 12
[252] Yet, if the contractor does not have sufficient capital or funds to pay a claim, and insurance is insufficient, then there is still a gap whereby the environment does not get remediated.
[253] Environmental Performance Guarantee *supra* note 249 at ss., 6, 11, Appendix 2 s. 43. The Contractor is at all times responsible for maintaining the form and amount of the approved Guarantee.
[254] *Ibid* at s. 14.
[255] *Ibid* at s. 18, Appendix 1, s. 6, Appendix 2, s. 25.
[256] *Ibid* at Appendix 2, s. 17.
[257] *Ibid* at Appendix 2, ss. 18, 20.
[258] *Ibid* at Appendix 2, ss. 6, 15, 16.
[259] *Ibid* at s. 8.

costs. This type of guarantee requires a history of financial stability, a favourable credit rating from a specialized credit rating service, and the provision of an annual financial statement prepared by a reputable international accounting firm.[260]

The Guarantee may also include a policy from security bonds deposited, a letter of credit or bank guarantee, or insurance.[261] The insurer issues the required security bonds to the ISA and pays the actual costs of the items. At the end of project life, a surplus in the account is remitted to the contractor; if there is a deficit, the insurer pays. An insurance guarantee includes the terms and conditions regarding the closure plan, agreed-upon costs, and conditions for releasing the bond.[262] An irrevocable letter of credit, also known as a "bank guarantee," is an unconditional agreement between a bank and a proponent to provide funds to the ISA on demand.[263] Finally, a deposit can be made for a financial guarantee such as cash, a bank draft, or a certified cheque. The funds should be placed in a dedicated account under the financial institution's management or be used to purchase a certificate of deposit, which may be pledged to the ISA.[264]

As part of the stakeholder feedback process, the nation of Costa Rica replied that it does not agree with the ISA's approach, which states that there should be a balance so that the Guarantee does not hinder the ability of the contractors to participate in the activities in the Area.[265] Costa Rica believes that the Guarantee should cover a contractor's closure-related obligations and any other environmental-related costs that the contractor cannot or is unwilling

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[260] *Ibid* at Appendix 2, s. 8.
[261] *Ibid* at Appendix 2, s. 9.
[262] *Ibid* at Appendix 2, s. 11.
[263] *Ibid* at Appendix 2, s. 10.
[264] *Ibid* at s. 12.
[265] Costa Rica, *Template for the review of the draft standards and guidelines associated with the Draft regulations on exploitation of mineral resources in the Area*, online: https://isa.org.jm/files/files/documents/Costa%20Rica.%20Draft%20standard%20and%20guidelines%20environmental%20performance%20guarantee%20.pdf. For a list of all replies, see ISA, *Submissions received with respect to the stakeholder consultations on Standards and Guidelines* (2020-2021) online: https://www.isa.org.jm/submissions-received-respect-stakeholder-consultations-standards-and-guidelines/.

to cover, including in cases of bankruptcy or other situations of insolvency and throughout the life of the exploitation contract as well as beyond the closing of the operation.[266] Moreover, the *Draft Exploitation Regulations* explicitly note the need to take a precautionary approach, apply an ecosystem approach, and apply the best environmental practice.[267]

There are significant gaps in the Draft Guarantee Standard.[268] No cost estimation tool or guidance on an acceptable cost estimate tool was provided. While a capitalized term, Validation is not defined in the Draft Standard. Where the applicant proposes a Guarantee, the ISA may engage its expert to assess and validate the Guarantee proposed by the applicant.[269] In other words, the valuation and validation of costs are still of primary concern. It should not be up to the contractor to determine the nature and amount of its Guarantee unless they conduct an objective valuation to value the amount required under its guarantee. A seabed mining valuation code could provide all of the necessary cost and valuation information to analyze the liabilities for the Guarantee. The *Draft Standards and Guidelines* assert that the responsibility to pay the Guarantee or other liabilities cannot be discharged by affiliates, related companies, sub-contractors or other entities, not the contractor.[270] This seems counterintuitive. It would be more responsible for a parent company, which has greater resources (or access to them), to guarantee or co-sign the guarantee. TMC could guarantee the operations of NORI.[271]

Further, Regulation 39 states that where a group of entities applies for approval of a plan of work, the Guarantee provides that each group member complies with the requirements of

[266] *Ibid*.
[267] *Draft Exploitation Regulations*, *supra* note 622 at Articles 2(e)(ii), 2(e)(iii), 44(a), 44(b) and 44(c).
[268] Keith MacMaster, "Sustainable Development and Seabed Mining, the Phase 1 Standards and Guidelines" 2023 Australian Yearbook of International Law [forthcoming].
[269] *Environmental Performance Guarantee supra note* 249 at s. 14.
[270] *Ibid* at Appendix 2, s. 44.
[271] *Ibid* at Appendix 2, s. 41(a).

Regulation 26.[272] The group's lead member shall calculate the level of the Guarantee required and confirm that the group (as opposed to the group members) holds or will hold a sufficient Guarantee for the plan's duration.[273] The Enterprise would qualify as a group. It is unclear how they could certify any financial arrangement. A sustainable seabed mining valuation code could help ensure that any work on valuations would be appropriate and make it easier for the Enterprise to obtain the necessary guarantees from a financial institution.

5.4 Conclusion

Polymetallic sulphides and cobalt crusts have different geological characteristics, making it almost impossible for an applicant to assess the economic value during prospecting.[274] The quality of minerals may differ from one spot to another, making it more difficult to divide based on economic value.[275] The applicant contractor, whether the Enterprise or some other entity, will have to engage in feasibility studies to assess the economic value.[276] The value of the Common Heritage of Mankind cannot be divorced from the valuation of the underlying mineral property. The ISA's Reporting Standard does not contain a valuation code, and the lack of environmental indicators is problematic. A seabed mining valuation code would assist the ISA and TMC in classifying and valuing the minerals in a prefeasibility and feasibility stage. TMC succinctly summarizes some problems with the current estimation process:

> No nodule source has yet reached the status of a reserve. This is mainly due to the absence of a regulatory framework and poor technical readiness level. The standard to report SMnN reserves has not been established yet. You are specifically cautioned not to assume that any part or all of the mineral deposits in these categories will ever be converted into mineral reserves, as defined by the SEC. You are also cautioned that mineral resources do not have demonstrated economic value. Inferred mineral resources

[272] *Draft Exploitation Regulations*, *supra* note 62.
[273] *Ibid* at Regulation 40; *Environmental Performance Guarantee supra note 249* at Paras 39-41.
[274] ISA, *Considerations Relating to the Regulations for Prospecting and Exploration for Hydrothermal Polymetallic Sulphides and Cobalt-Rich Ferromanganese Crusts in the Area* ISBA/7/C/2 29 (May 2001) at 4.
[275] Agustina Merdekawati & I Made Andi Arsana, "Equity Interest Scheme in Polymetallic Nodules Deep Seabed Mining: The Positives and Negatives" 29:1 (2022) Jurnal Media Hukum at 37.
[276] *Ibid* at 38.

have a high degree of uncertainty about their existence and whether they can be economically or legally commercialized. [277]

[277] SEC, "TMC/SOAC Prospectus Amendment No. 4 to Form S-4" File No. No. 333-255118 (28 July 2012).

Chapter 6 – International Sustainable Development and Sustainable Finance

6.0 Background

On 12 April 2022, Tuvalu cancelled its sponsorship of Circular Metals Ltd.[1] This marked the first time a country terminated its State Sponsorship for seabed mining activities in the Area.[2] The Tuvalu foreign minister, upon cancelling sponsorship of its contract, said:

> The part that we can play is to ensure that we set very high standards or the environmental issues that are involved in requirements, which could then hopefully discourage companies from pursuing it, because it'll be very costly.[3]

This comment suggests potential latent issues with seabed mining from a sustainable development perspective. Several groups have called for a moratorium on seabed mining, including the European Parliament, the national leaders of several island States, organizations such as Fauna and Flora International, and the World Wildlife Fund.[4]

Chapter 6 sets out sustainable development law principles for seabed mining. These principles include the precautionary approach, the ecosystem approach, intergenerational equity, governance, and environmental impact assessments. Chapter 6 expands on and critiques sustainable ocean development through the work of the High Level Panel for a Sustainable Ocean Economy and the *Sustainable Blue Economy Finance Principles*.[5] International

[1] Prianka Srinivasan, "Tuvalu reverses controversial decision to sponsor seabed mining" ABC Pacific, online: https://www.abc.net.au/radio-australia/programs/pacificbeat/tuvalu-reverses-seabed-mining-sponsorship/13840364.
[2] Alberto Pecoraro, "Tuvalu cancels its sponsorship: the role of international law" DSM Observer (2 May 2022) online: https://dsmobserver.com/2022/05/tuvalu-cancels-its-sponsorship-the-role-of-international-law/.
[3] Simon Kofe, Tuvalu Foreign Minister, "Tuvalu reverses decision to sponsor seabed mining" (22 April 2022) online: https://oceanminingintel.com/news/regulation/tuvalu-reverses-decision-to-sponsor-seabed-mining..
[4] Save the High Seas, "European Parliament calls for a Moratorium on Deep-Sea Mining" online: http://www.savethehighseas.org/2021/06/10/european-parliament-calls-for-a-moratorium-on-deep-sea-mining/; Flora and Fauna, "Risks of Seabed Mining" online: FFI_2020_The-risks-impacts-deep-seabed-mining_Executive-Summary.pdf (fauna-flora.org); WWF, "Moratorium" online: Brands Back Call for Moratorium on Deep Seabed Mining | WWF (panda.org).
[5] High Level Panel for a Sustainable Ocean Economy, *Transformations for a Sustainable Ocean Economy, 2020; The Sustainable Blue Economy Finance Principles*, online: https://www.unepfi.org/blue-finance/the-principles/.

sustainable development law is applied to the Common Heritage of Mankind and the 'need' for the critical minerals found on the seafloor. Any valuation code should include sustainable mining frameworks, such as the Towards Sustainable Mining, the IGF Mining Policy Framework, and the UNEP Principles on Tailings Management.[6] Finally, sustainable finance is defined through a concept of international sustainable finance law and the capital asset pricing model for nature. Integrating environmental costs into economic instruments assists in valuing crises such as climate change, biodiversity loss and rising inequality.[7] These frameworks complement valuing minerals environmentally and socially sustainably. Land-based valuation codes are incomplete because they do not incorporate many environmental and social valuation techniques.

6.1 Sustainable Development

Sustainable development was defined in *Our Common Future, the 1987 World Commission on Environment and Development Report,* as development that "meets the needs of the present without compromising future generations' ability to meet their own needs."[8] Philippe Sands succinctly describes it as law which promotes economic development, environmental protection and respect for civil and political rights.[9] Sustainable development was premised on the

[6] Mining Association of Canada, "Towards Sustainable mining" online: https://mining.ca/towards-sustainable-mining/; UNEP & ICMM, *Global Industry Standard on Tailings Management* (August 2020) online: https://wedocs.unep.org/bitstream/handle/20.500.11822/36139/GISTM_En.pdf; *IGF Mining Policy Framework, Mining and Sustainable Development* (IGF, October 2013).
[7] TFCD, *Recommendations of the Task Force on Climate-related Financial Disclosure* (2017); Implementing the Recommendations of the Task Force on Climate-related Financial Disclosures (2016); FSC-TFCD, "Task Force on Climate-related Financial Disclosures" online: https://www.fsb-tcfd.org/.
[8] *Our Common Future: Report of the World Commission on Environment and Development* UN Doc. A/42/427 (Geneva, 1987) at Para 27.
[9] Johanna Aleria Lorenzo, "International law-making in the field of sustainable development and an emerging droit commun among international financial institutions" (2018) 7:2 Cambridge International Law Journal 327–353; Philippe Sands, *Principles of international environmental law*, 4th (Cambridge, 2018).

development problem, the mobilization and development of scarce resources, and has emerged as a political-economic concept tackling environmentally threatening development.[10]

The *Rio Declaration on Environment and Development,* in 1992, asserts that "human beings are at the centre of concerns for sustainable development and are entitled to a healthy and productive life in harmony with nature."[11] In 1994, the economist John Elkington introduced a three-pillar approach, with the economic, social and environmental dimensions depicted as three equally important sustainable development objectives.[12]

In 2015, one hundred seventy (170) world leaders endorsed the Sustainable Development Goals ("SDGs"). SDG14, *Life Below Water*, attempts to enhance the conservation and sustainable use of oceans and their resources.[13] SDG7 calls for a transition to a cleaner energy system. Mining companies' contributions to the SDGs include improvements toward the SDGs and the corresponding targets above the baseline and preventing or mitigating negative impacts on the SDGs and corresponding targets.[14] Finance is indirectly included in SDG17 to strengthen the means of implementation and revitalize the global partnership for sustainable development.[15] The ISA has made SDG14 a strategic priority.[16] The ISA claims that the commitments will help strengthen the rule of law in ocean governance, benefit humanity, help ensure a rapid transition

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[10] Vincent Bellinkx, "The Transformational Character of Sustainable Development Law in Multilateral Energy Investment: Why principles matter" (2021) 17:2 McGill International Journal of Sustainable Development Law and Policy 276 at 284.
[11] *Conference on Environment and Development, Rio de Janeiro (Brazil: 3-14 June 1992*, by UN; *Rio Declaration on Environment and Development*, by UNCED, 31 I.L.M. 874 UN Doc. A/CONF.151/5/Rev.1, (1992) at Annex I.
[12] John Elkington, "Partnerships from Cannibals with Forks: the Triple Bottom Line of 21st Century Business" (1998) 8:1 Environmental Quality Management 37
[13] *Transforming Our World: The 2030 Agenda for Sustainable Developmen*t, 69th Session, UN Doc A/70/L1 2015.
[14] Africa Renewal, "How can mining contribute to the Sustainable Development Goals?" (6 October 2015), online: https://www.un.org/africarenewal/news/how-can-mining-contribute-sustainable-development-goals.
[15] UN, "SDG17" online: https://sdgs.un.org/goals/goal17.
[16] *Implementation of the Strategic Plan for the International Seabed Authority: Draft Performance Indicators for the 2019-2023 period* (ISA, 2019) at 3; ISA, "Contribution to the SDGs" online: https://www.isa.org.jm/contribution-isa-sdgs; ISA, "Voluntary Commitments to SDG14" online: https://www.isa.org.jm/isa-voluntary-commitments.

to a low-carbon economy, prevent environmental harm via their regulatory framework, and help community members obtain skills to mine the seafloor.[17]

Sustainable development provides a framework for writing, modifying, and implementing laws and developing appropriate institutions and institutional arrangements to further sustainable development in specific places and contexts.[18] This includes private legal issues of certification, labelling, and sustainability reporting.[19] These principles are the precautionary approach, intergenerational equity, good governance and public participation, environmental impact assessments, and the polluter pays principle.[20]

6.1.1 Precautionary Approach

The precautionary principle (or approach) is found in Principle 15 of the Rio Declaration:

> To protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.[21]

The precautionary approach requires actors to protect the environment, even if scientific uncertainties remain.[22] Precaution requires favouring earlier measures to anticipate and prevent the risk, favouring greater protection and a qualifying stance on the impacts of the precautionary measures, weighing costs and benefits, and reassessing and improving over time.[23]

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[17] *Ibid* at 15.
[18] Philippe Sands, "International Law in the Field of Sustainable Development" (1995) 65 British Yearbook of International Law 303 at 379.
[19] John Dernbach & Federico Cheever, "Sustainable Development and Its Discontents" (2015) 4:2 Transnational environmental law 247.
[20] Bellinkx, *supra* note 10 at 285.
[21] Rio Declaration, *supra* note 11 at Principle 15.
[22] N. de Sadeleer, "The Precautionary Principle and Climate Change" in M. Faure [ed.] *Elgar Encyclopedia of Environmental Law*, (Edward Elgar, 2016) at 25; E. Morgera, "The Ecosystem Approach and the Precautionary Principle" in M. Faure (ed) *Elgar Encyclopedia of Environmental Law* (Edward Elgar, 2017) at 70-80; Arie Trouwborst, "The Precautionary Principle in General International Law: Combating the Babylonian Confusion" (2007) 16:2 Review of European Community & International Environmental Law 185 at 195.
[23] J.B. Wiener, "Precautionary Principle" in M. Faure (ed) *Elgar Encyclopedia of Environmental Law* (Edward Elgar, 2018) at 179.

The precautionary approach is a central and well-established principle under international environmental law.[24] UNCLOS does not make express provision for the precautionary approach, as it predates the rise of the precautionary approach in international law. Nonetheless, it has been argued by judges and scholars alike that the precautionary approach can be implied.[25] Part XII of UNCLOS imposes a general obligation to protect and preserve the marine environment.[26] States are required, for example, to ensure that activities in the Area are effectively controlled, protect the marine environment from harmful effects, and ensure activities do not cause damage by pollution.[27] According to the Draft Exploitation Regulations, states, the ISA and contractors must apply a precautionary approach.[28] To this end, they shall apply the precautionary approach, as reflected in principle 15 of the *Rio Declaration*, to assess and manage the risk of harm to the marine environment from exploitation in the Area.[29]

The *Southern Bluefin Tuna* cases resulted from a disagreement between Australia, New Zealand, and Japan. Japan had exceeded its previously agreed limit for southern bluefin tuna harvested.[30] The ITLOS Tribunal did not expressly discuss the precautionary principle, stating that parties should act prudently to take effective conservation measures to prevent serious harm to southern bluefin tuna stock.[31] The principles suggest precautionary measures should be based

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[24] G. Warwick, "The Contribution of the Precautionary Principle to Marine Environmental Protection" in Barnes & S Kaye (eds) *Frontiers in International Environmental Law: Oceans and Climate Challenges* (Brill Nijhoff, 2021) at 368.
[25] Aline L Jaeckel, *The International Seabed Authority and the Precautionary Principle: Balancing Deep Seabed Mineral Mining and Marine Environmental Protection* (Brill Nijhoff, 2017) at 90.
[26] *United Nations Convention on the Law of the Sea* 1833 UN Treaty Series 397, 1982 at Article 192; *Re Arbitration Between the Republic of the Philippines and the People's Republic of China* (12 July 2016) *PCA Case No 2013-19*, at Para 940 [*South China Sea Arbitration*].
[27] *UNCLOS*, *supra* note 26 at Articles 139(1), 145, 194(2).
[28] *Draft Regulations on Exploitation of Mineral Resources in the Area (2019) ISBA/25/C/WP1* at Regulations 2(e)(ii), 44(a), 31.
[29] *Ibid* at Regulation 2(e)(ii), 44.
[30] *Southern Bluefin Tuna Cases (New Zealand v Japan; Australia v Japan) (Provisional Measures)* [1999] ITLOS Cases No 3 & 4 ITLOS Cases No 3 & 4 [*Bluefin Tuna*].
[31] David L VanderZwaag, "The ICJ, ITLOS and the precautionary approach: paltry progressions, jurisprudential jousting" (2013) 35:2 Hawaii L Rev 617.

on science, technology and society's chosen level of protection, proportional to the potential severity of the risk being addressed and to society's chosen level of protection, non-discriminatory and consistent with measures taken in similar circumstances, cost-effective, and generate an overall net benefit for society.[32]

The *Seabed Advisory Opinion* observes that the words "to ensure" concern conduct may be an obligation of due diligence.[33] The *Seabed Advisory Opinion* declares that the precautionary approach is integral to the obligation of due diligence.[34] Due diligence requires States to take appropriate measures to prevent damage. It applies where scientific evidence concerning the activity's scope and potential negative impact is insufficient but where there are plausible indications of potential risks.[35] There is an implicit link between due diligence and precaution through various statements that prudence and caution require conservation measures where there is scientific uncertainty.[36] States disregarding the risk of negative impacts do not satisfy the due diligence obligation or comply with the precautionary approach.[37] Rio Principle 15 has initiated a trend towards making this approach part of customary international law.[38] The *South China Sea Arbitration*, more recently, added:

> States have the obligation to protect and preserve the marine environment." Although phrased in general terms, the Tribunal considers it well established that Article 192 does impose a duty on States Parties, the content of which is informed by the other provisions of Part XII and other applicable rules of international law. This "general obligation" extends both to "protection" of the marine environment from future damage and "preservation" in the sense of maintaining or improving its present condition. Article 192 thus entails the positive obligation to take active measures to protect and preserve the marine environment, and by logical

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[32] David Vanderzwaag, Susanna Fuller & Ransom Myers, "Canada and the precautionary principle/approach in ocean and coastal management: wading and wandering in tricky currents" (2002) 34:1 Ottawa L Rev 117.
[33] *Responsibilities and Obligations of States Sponsoring Persons and Entities with Respect to Activities in the Area* (Advisory Opinion), [2011] ITLOS Case No 17 at para 110; Donald Anton, Robert Makgill & Cymie Payne, "Seabed Mining - Advisory Opinion on Responsibility and Liability" (2011) 41:2 Environmental Policy and Law 60.
[34] *Ibid* at para 131.
[35] *Ibid*.
[36] *Ibid* at para 132; *Bluefin Tuna*, *supra* note 30 at paras 77, 79, 80.
[37] *Ibid* at para 131.
[38] *Ibid* at para 135.

implication, entails the negative obligation not to degrade the marine environment.[39]

The South China Sea Arbitration concurs that the obligation 'to ensure' requires due diligence. A State should adopt appropriate rules and measures and a certain level of vigilance in their administration and enforcement.[40] The precautionary approach seeks to enable decision-making despite uncertainty, which means assessing or modelling environmental risk value judgments is important when applying a precautionary approach.[41] The degree of risk we allow depends on the relative values we assign to the exploitation of seabed minerals versus the protection and preservation of the marine environment and its ecosystem services and integrity. This raises important questions concerning the level of acceptable environmental harm and the degree of harm we are prepared to risk in pursuing seabed minerals.[42] Protective measures taken in the name of precaution involve three considerations: scientific knowledge (the known facts), uncertainties (the limit of our knowledge and the assumptions made), and value considerations.[43] The evaluation of impacts now includes social and environmental impacts.[44] The precautionary approach guides decision-makers to determine if the knowledge gap is tolerated and a decision made despite it or if the decision should be delayed while attempting to narrow the gap and how much time, effort and resources should be spent on that endeavour.'[45]

The precautionary approach administratively and judicially applies to all stages of seabed

[39] *South China Sea Arbitration*, *supra* note 26 at para 941.
[40] *Ibid* at para 940.
[41] Robert Makgill, Aline Jaeckel & Keith MacMaster, "Implementing the precautionary approach for deep seabed mining: a review of state practice" Virginie Campanella, ed, *Routledge Handbook of Seabed Mining* (Routledge, 2022).
[42] M. Stanley and T. Arin, *Precautionary Management of Deep Sea Minerals–- Pacific Background Paper No 2*, (World Bank, 2017) at 41.
[43] Jaeckel, *supra* note 25 at 49.
[44] David Szablowski, Transnational Law and Local Struggles: Mining, Communities, and the World Bank (Oxford, 2007 at 49-50.
[45] C. Munthe, "The Black Hole Challenge: Precaution, Existential Risks and the Problem of Knowledge Gaps" (2019) 22 *Ethics, Policy and Environment* 49.

mining.[46] The precautionary approach indicates that positive action to protect the environment may be required before scientific proof of harm has been provided. The precautionary approach is triggered when, for a given action, there is potential for harm and uncertainty about causality and magnitude of impacts.[47] It applies to States and the ISA when determining the rules and regulations for seabed mining. States, the ISA, and private contractors must apply a precautionary approach when undertaking preliminary work supporting an application for exploration or exploitation, including establishing environmental baseline information and preparing environmental impact assessments. Precaution informs judicial consideration of the legal and evidential questions concerning the first three stages of seabed mining.[48]

The ISA has not yet provided clear regulatory guidance on implementing key environmental obligations to seabed mining within the Area. The *Mining Code* does not provide any measurable direction (objectives or targets) for achieving the effective prevention of marine environmental damage obligation.[49] The ISA has yet to promulgate environmental thresholds beyond which the adverse impacts of seabed mining would be determined unacceptable.[50] Michael Lodge, the ISA Secretary-General, and Verlaan contend:

> [i]t must be stressed … that it is useless and counter-productive to argue that an a priori condition for deep-sea mining is an existential debate about whether it should be permitted to go ahead or not. The international community passed that point already many years ago. This is because the one factor that distinguishes deep seabed mining from any other extractive activity, or indeed any other ocean use, is the nature of the underlying legal regime established by the Law of the Sea Convention.[51]

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[46] *Seabed Advisory Opinion*, *supra* note 33 at 17; Draft Exploitation Regulations, *supra* note 28 at Regulations 2(2), 5(1), 31(2), 31(5), Annex IV, s. 5.1.
[47] Makgill, Jaeckel & MacMaster, *supra* note 41.
[48] *Ibid* at 57.
[49] *Draft Exploitation Regulations*, *supra* note 28 at Regulation 13(4)(c); Verena Tunnicliffe et al, "Strategic Environmental Goals and Objectives: Setting the basis for environmental regulation of deep seabed mining" (2020) 114 Marine Policy 103347.
[50] Aline Jaeckel, *The Implementation of the Precautionary Approach by the International Seabed Authority*, ISA Discussion Paper No. 5 (ISA, 2017) at 3.
[51] M. Lodge and P. Verlaan, "Deep-Sea Mining: International Regulatory Challenges and Responses" (2018) 14:5 *Elements* 331 at 336.

The precautionary approach applies to seabed mining activities under UNCLOS, irrespective of whether the principle remains an emerging rule or has attained customary international law status because it is held aloft through its intrinsic relationship with the customary law of due diligence.[52] Accordingly, the ISA and States are required to take measures to prevent, reduce, and control pollution of the marine environment from seabed mining activities.[53] Churchill and Lowe have observed that the law of the sea aims to prevent substances added to the sea that result in deleterious effects.[54] Pollution should be prevented where knowledge of the potential damage (i.e., adverse impacts or effects) requires such a decision.[55]

Seabed mining contractors acknowledge precaution. TMC explicitly declares: "NORI will apply the Precautionary Approach throughout the ESIA [environmental and social impact analysis] process with continued adoption throughout the project's operational phase.[56] Nevertheless, there are still fundamental problems with applying the precautionary approach to seabed mining. Thus, deciding which precautionary measures are appropriate for deep seabed mining requires an assessment of the potentially harmful effects and the risks posed by incomplete information and uncertainty.

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[52] Makgill, Aline Jaeckel & Keith MacMaster, *supra* note 41.
[53] *UNCLOS*, *supra* note 26 at Articles 145, 194(1), 208, 209. Article 1 states: pollution of the marine environment is defined as meaning 'the introduction by man, directly or indirectly, of substances … into the marine environment … which results or is likely to result in such deleterious effects as harm to living resources and marine life.
[54] R. Churchill and V. Lowe, *The Law of the Sea*, 3rd ed. (Manchester University Press, 1999) at 392; R. Makgill, J. Gardiner-Hopkins, and N. Coates, "Current Legal Developments: New Zealand" (2020) 35 The International Journal of Marine and Coastal Law at 845.
[55] ISA, *Biodiversity, species ranges, and gene flow in the abyssal Pacific nodule province: predicting and managing the impacts of deep seabed mining* ISA Technical Study No. 3 (Jamaica, 2008) at 4-6; S. Bonney, 'Bioprospecting, Scientific Research and Deep Sea Resources in Areas Beyond National Jurisdiction: A Critical Legal Analysis' (2006) 10 *New Zealand Journal of Environmental Law* at 52; J. Halfar and R. Fujita, "Precautionary management of deep-sea mining" (2019) 26 *Marine Policy* at 105.
[56] Sustainable Opportunities Acquisition Corp, *Amendment No. 3 to FORM S-4 Registration Statement under the Securities Act of 1933 Filed Pursuant to Rule 424(b)(3) Registration No. 333-260126* (28 July 2021), online: https://www.sec.gov/Archives/edgar/data/0001798562/000121390021039153/fs42021a4_sustainableoppo.htm.

At a minimum, the ISA must approach seafloor mining cautiously, adopt the precautionary principle to protect marine life and avoid exacerbating adverse impacts. While a short-term localized adverse effect may cause unacceptable harm, a long-term adverse effect could result in an irreversible ecosystem-wide level of harm.

6.1.2 Environmental Assessment

The International Association for Impact Assessment defines Environmental Assessment ("EA") or Environmental Impact Assessment ("EIA") as "the process of identifying, predicting, evaluating and mitigating the physicochemical, biological, socioeconomic, and other relevant effects of development proposals prior to major decisions being taken and commitments made."[57] An EA should evaluate a project's potential environmental risks and impacts, examine project alternatives, and identify ways to improve project selection, siting, planning, design, and implementation by preventing, minimizing, mitigating, or compensating for adverse environmental enhancing positive impacts.[58] The primary goal of these assessments is to inform decisions on whether and under what conditions to approve proposed new activities.[59]

An EIA often addresses social and socioeconomic issues. Current scholarship often refers to this process as Impact Assessment ("IA") to holistically capture the social impacts of proposed projects.[60] For example, the Canadian *Impact Assessment Act* emphasizes the

[57] International Association for Impact Assessment, "IAIA" online: https://www.iaia.org.
[58] Alex Oude Elferink, "Environmental Impact Assessment in Areas beyond National Jurisdiction" (2012) 27:2 International Journal of Marine and Coastal Law 449–480.
[59] Meinhard Doelle & Gunnar Sander, "Next Generation Environmental Assessment in the Emerging High Seas Regime? An Evaluation of the State of the Negotiations" (2020) 35:3 The international journal of marine and coastal law 498–532; Meinhard Doelle & A John Sinclair, *The next generation of impact assessment : a critical review of the Canadian Impact Assessment Act* (Toronto: Irwin Law, 2021); David V Wright & Meinhard Doelle, "Social Cost of Carbon in Environmental Impact Assessment" (2019) 53:3 UBC Law Rev.
[60] Marla Orenstein, Erica Westwood & Susan Dowse, "Effect characterization in social impact assessment: a scan of current practice" (2019) 37:1 Impact assessment 48; Suzy Nikièma, *Legal Framework of Environmental and Social Impact Assessment in the Mining Sector* (Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development, 2019).

importance of public and Indigenous participation throughout the impact assessment process, beginning from the planning and scoping stage, emphasizing and defining 'meaningful' public participation.[61] After the completion of an IA, the federal government must consider whether the project is "in the public interest," which includes consideration of which impacts are identified, how they are to be mitigated, impacts on Indigenous communities, impacts on Canada's climate commitments, and how the project contributes to or impacts sustainability.[62]

Cumulative impacts with regards to an EIA should look at the direct impacts of several parallel mining operations on the environment, including impacts on habitat, biodiversity, ecological connectivity, and food webs, as well as the interaction between mining operations and other stressors, such as climate change and fisheries, where applicable. Cumulative impact assessment is particularly important in a seabed mining context. Many areas proposed to be mined, including in the proximity of hydrothermal vent ecosystems, are particularly fragile and remain unexplored regarding potential mining impacts.[63] Cumulative impacts must be properly integrated into the environmental management and monitoring plans, feasibility studies, and closure plans to mitigate these impacts effectively.[64] Public participation should be included throughout the process.[65]

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[61] *Impact Assessment Act* S.C. 2019, c.28.; Doelle & Sinclair, *supra* note 59.
[62] *Ibid*.
[63] Patrick Collins et al, "A Primer for the Environmental Impact Assessment of Mining at Seafloor Massive Sulfide Deposits" (2013) 42 Marine Policy 198.
[64] Angus Morrison-Saunders et al, "Reflecting on, and revising, international best practice principles for EIA follow-up" (2021) 89 Environmental impact assessment review 106596; M Erkayaoğlu & N Demirel, "A comparative life cycle assessment of material handling systems for sustainable mining" (2016) 174 Journal of environmental management 1; Antonio Pedro et al, "Towards a sustainable development licence to operate for the extractive sector" (2017) 30:2 Miner Econ 153; A. Manuilova, et al., "Should Life Cycle Assessment be part of the Environmental Impact Assessment?" (2019) 1:1. Energy Procedia 4511 at 4518; Jennifer Durden et al, "Environmental Impact Assessment Process for Deep-Sea Mining in the Area" (2018) 87 Marine Policy 194.
[65] Collins et al, *supra* note 63.

6.1.2.1 Seabed Mining and EAs

The carrying out of an EIA is a general obligation under international law.[66] It is also required for seabed mining.[67] In their *Seabed Advisory Opinion,* which stresses the importance of marine protection over economic outputs, the ITLOS reinforced the need for an EIA, noting, "the Sponsoring State is under a due diligence obligation to ensure compliance by the sponsored contractor with its obligation to conduct an EIA."[68] The *Draft Exploitation Regulations* require an EIA to identify, predict, evaluate, and mitigate the proposed mining operation's biophysical, social, and environmental effects.[69] An application of a plan of work shall be accompanied by an assessment of the proposed activities' potential environmental impacts and include oceanographic and baseline environmental studies. The EIA should include an environmental risk assessment to describe and predict environmental effects and manage such effects within acceptable levels.[70] Guidelines put forth by the ISA to date lack an explicit expert review process and fail to identify how experts are assigned. Also, the ISA has not defined what 'acceptable environmental levels' are.[71]

An Environmental Impact Statement ("EIS") is a document intended for decision and policymakers to establish if the project should be permitted based upon the assessment of impacts presented throughout the EIA. The *Draft Exploitation Regulations* provide for an EIS. The EIS is to provide the ISA, Sponsoring States, stakeholders, and applicant contractors with

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[66] *UNCLOS*, *supra* note 26 at Articles 165(2), 206; Malcolm R Clark, Jennifer M Durden & Sabine Christiansen, "Environmental Impact Assessments for deep-sea mining: Can we improve their future effectiveness?" (2020) 114 Marine policy; *Pulp Mills on the River Uruguay (Argentina v Uruguay*, [2010] ICJ Rep 71 [*Pulp Mills*].
[67] *UNCLOS* at Annex 1, ss. 2, 7, Seabed Advisory Opinion *supra* note 33 at para 141, 217.
[68] *Seabed Advisory Opinion*, *supra* note 33 at para 236; UNCLOS, *supra* note 26 at Article 153(4), 206.
[69] *Draft Exploitation Regulations*, *supra* note 28 at Regulation 47.
[70] *Ibid*.
[71] ISA, Draft D*ecision of the Council of the International Seabed Authority relating to the Development of binding environmental threshold values submitted by the delegation of Germany*, ISBA/27/C/L.4 (27 September 2022); ISA, *Decision of the Council of the International Seabed Authority relating to the development of binding environmental threshold values* ISBA/27/C/42 (11 November 2022).

"unambiguous documentation of the potential Environmental Effects on which the ISA can base its assessment, and any subsequent approval that may be granted."[72] The EIS shall include a prior environmental risk assessment and be based on the results of the EIA.[73] The *Draft Exploitation Regulations* also provide a template for an EIS.[74] The EIS shall be prepared in plain language and provide the necessary information in proportion to their significance.[75] Where an applicant considers an effect insignificant, there should be sufficient information to substantiate such a conclusion or a brief discussion about why further research is not warranted.[76]

The *Draft Standard and Guidelines for environmental impact assessment process ("Draft EIA Standard")* create requirements that an applicant contractor must comply with in undertaking an EIA and preparing an EIS.[77] Social and socioeconomic issues should be present.[78] Factors should include socioeconomic benefit optimization, social impacts of the permit application process, training and hiring, impacts of mining on Indigenous peoples, cultural heritage, resettlement, and community safety and security, and government revenues from mining generated from a mix of taxes, royalties and other revenue streams.[79]

The ISA, in 2022, released its *Recommendations for the guidance of contractors for the assessment of the possible environmental impacts* ("EA Recommendations").[80] The EA Recommendations define the marine environment's biological, chemical, geological, and

[72] *Draft guidelines for the preparation of environmental impact statements* ISBA/27/C/5 (22 January 2022) at Appendix 1.
[73] *Draft Exploitation Regulations*, *supra* note 28 at Regulation 47.
[74] *Ibid* at Annex IV.
[75] *Ibid* at Annex IV, Regulation 47.
[76] *Ibid*.
[77] *Draft standard and guidelines for the environmental impact assessment process* ISBA/27/C/4 (31 January 2022) at 1.
[78] Lorenzo, *supra* note 9 at 339.
[79] ISA, *supra* note 71; Oude Elferink, *supra* note 58 at 478.
[80] ISA, *Recommendations for the guidance of contractors for the assessment of the possible environmental impacts arising from exploration for marine minerals in the Area*, ISBA/25/LTC/6/Rev.1 (30 March 2020).

physical elements that should be measured and how to acquire adequate baseline and monitoring data throughout the exploration process, stressing that "the best available technology and methodology for sampling should be used in establishing baseline data."[81] The EA Recommendations add additional requirements for collecting baseline data, including polymetallic nodules, polymetallic sulphides, and cobalt-rich ferromanganese crusts.[82]

Cumulative impact analysis is explored in both the *Draft Standards and Guidelines* on the EIA process and EIS, noting the importance of cumulative evaluations of temporal accumulation, spatial accumulation, perturbation type, the process of accumulation, functional effects, and structural effects.[83] Cumulative and regional effects consider how the proposed project may have a regional impact biologically, socially, and economically. There remains a lack of discussion as to how upscaling of impacts should be standardized across proposals or the integration of regional bodies, such as the ISA, that may aid in data and proposal sharing prior to the collection of primary data to help ensure the accuracy of measurements of regional or cumulative impacts and to mitigate research in potentially fragile environments.

The *Draft Guidelines for the preparation of an environmental impact statement* ("Draft EIS Guidelines") assist the reporting process followed during the implementation of the EIA and provide an impact assessment for the environmental and other effects identified.[84] The *Draft EIS Guidelines* emphasize the importance of considering the project context from a legal, policy, psychochemical, biological, and socioeconomic perspective.[85] Specifics are given for each of these contexts, including a list of known species in the marine environment at the surface,

[81] *Ibid* at 6, para 17.
[82] *Ibid*.
[83] *Ibid.*
[84] *Draft EIS guidelines, supra note 72* at 1.
[85] *Ibid.*

midwater, and benthic depths and how potential impacts would affect their habitat and food chain.[86] Action plans for accident responses are also required, yet the guidelines lack details, specifically on cleanup and ongoing monitoring in the case of an accident.[87] Consultation with stakeholders is encouraged throughout every process step and is to be documented in the EIS.[88]

Despite including socioeconomic perspectives within the EIS, the examples provided (tourism, fisheries, marine traffic, economic climate, and sites of archeological or historical significance) largely overlook the social climate and community in the proposed project area.[89] There is no mention within the *Draft EIS Guidelines*, nor the others, about including Indigenous rights and perspectives in the EIA process. Including Indigenous perspectives within an impact assessment not only provides baseline due diligence for understanding and potentially mitigating impacts but also allows for gathering valuable and relevant information on the baseline environmental conditions of the proposed project area through an understanding of traditional ecological knowledge.[90] In both the *Draft EIA Standard* and the *Draft EIS Guidelines*, there is a lack of thorough consideration of Indigenous land use, local cultural considerations, and overall impacts on communities.

The *United Nations Declaration on the Rights of Indigenous Peoples* ("UNDRIP") was adopted by the General Assembly on Thursday, 13 September 2007.[91] On 21 June 2021, the United Nations Declaration on the Rights of Indigenous Peoples Act received Royal Assent and

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[86] *Ibid* at Appendix 1.
[87] *Ibid*.
[88] *Ibid.*
[89] *Ibid.* Social climate refers to the behaviours, customs, and attitudes of a specific region or community.
[90] Ruckstuhl, Katharina, Michelle Thompson-Fawcett and Hauauru Rae, "Māori and Mining: Indigenous Perspectives on Reconceptualising and Contextualising the Social Licence to Operate" (2014) 32:4 Impact Assessment and Project Appraisal 304.
[91] *United Nations Declaration On The Rights Of Indigenous Peoples* online: https://social.desa.un.org/issues/indigenous-peoples/united-nations-declaration-on-the-rights-of-indigenous-peoples#:~:text=The%20United%20Nations%20Declaration%20on,%2C%20Bangladesh%2C%20Bhutan%2C%20Burundi%2C.

came into force in Canada.[92] This Act provides a roadmap for the Government of Canada and First Nations, Inuit and Metis peoples to work together to implement the Declaration based on lasting reconciliation, healing, and cooperative relations. From Canada's experience, co-governance with Indigenous communities and active participation and implementation of traditional ecological knowledge in the assessment and decision-making processes should be critical components of any EIA. Governance should prioritize the diversity of the impacted communities and recognize the varying individual impacts a project may have based on personal identity factors, including gender, which is incorporated into Canada's legislation by including a gender-based assessment requirement for all impact assessments.[93] Consideration for the intersectionality of impacts based on gender and other social factors is neglected throughout the *Standards and Guidelines*, which focus predominantly on uniform social, biophysical, and economic impacts. Integration of social and environmental factors in the EIA requires improvement. There is a lack of detail regarding the methodology for collecting robust data or thresholds for when environmental damages may be too severe that may be resource-and-site specific, given the current paucity of data to support a detailed understanding of ecological relationships and impacts associated with seabed mining.[94] As such, the ISA should take note of UNDRIP and ensure that integrating rights of Indigenous Peoples are integrated into all EA requirements.

[92] *United Nations Declaration on the Rights of Indigenous Peoples Act* S.C. 2021, c. 14
[93] D. Hoogeveen, et al., "Sex, mines, and pipelines: Examining Gender-based Analysis Plus in Canadian impact assessment resource extraction policy" (2021) 8:3 *The Extractive Industries and Society* 100921.
[94] UNEP FI, *Harmful Marine Extractives: Understanding the risks & impacts of financing non-renewable extractive industries* (Geneva: UNEP FI, 2022) at 10.

6.1.2.2 Environmental Monitoring

Contractors and Sponsoring States must cooperate with the ISA to establish monitoring programmes to evaluate the ongoing marine environmental impact of seabed mining.[95] Monitoring activities are a matter of customary international law, as set out in the *Pulp Mills* case and obligations under the Mining Code.[96] Outlined in the *Draft Exploitation Regulations*, contractors shall, "consistent with the relevant Guidelines, carry out exploitation under an exploitation contract with reasonable regard for other activities in the marine environment following UNCLOS Article 147 and the approved Environmental Management and Monitoring Plan and Closure Plan and any applicable international rules and standards established by competent international organizations."[97]

An Environmental Monitoring and Management Plan ("EMMP") aims to ensure that environmental effects meet the environmental quality objectives and standards for the mining operation.[98] The EMMP will set out commitments and procedures on implementing mitigation measures, monitoring the effectiveness of such measures, management actions to these results, and adopting and implementing reporting systems. They shall be prepared per the applicable Guidelines and consistent with other regulations, including the Closure Plan.[99] Thus, the EMMP requires a Guideline and a separate Closure Plan Standard, which, as described below, has not been created as of the date of writing.[100] Additionally, a contractor must implement all applicable mitigation and management measures to protect the marine environment and conduct

[95] *Seabed Advisory Opinion*, *supra* note 33 at para 143.
[96] *Pulp Mills*, *supra* note 66 at para 176, 197, 205, 266.
[97] *Draft Exploitation Regulations*, *supra* note 28 at Regulations 31, 48.
[98] *Draft Guidelines for the preparation of environmental management and monitoring plans ISBA/27/C/6 (31 January 2022) at* 1, para 2.
[99] *Draft Exploitation Regulations*, *supra* note 28 at Regulation 48.
[100] *Ibid* at Regulations 38, 45.

performance assessments as set out in the Standards while maintaining the currency and adequacy of the EMMP during the term of its exploitation contract.[101]

Draft Exploitation Regulation, Annex IV, links the EIS with the Environmental Management and Monitoring Plan, stating that the EIS must include information on environmental management, monitoring, and reporting.[102] The *Draft Guidelines for preparing environmental management and monitoring plans* ("Draft EMMP Guideline") contain a brief introduction and an Appendix. Appendix I to the *Draft EMMP Guideline* contains non-prescriptive details for contractors regarding formulating an environmental management and monitoring approach.[103] The *Draft EMMP Guideline* requires adaptive management and a precautionary approach consistent with Principle 15 of the *Rio Declaration.*[104]

A Monitoring Program should identify necessary parameters to evaluate environmental effects, including the proposed environmental monitoring/sampling methodology, standards, protocols, methodologies, and procedures for collecting, analyzing, and interpreting data. It should include details of the proposed monitoring stations across the project area, name the performance standards incorporated by reference, and provide the risk assessment and management techniques, including adaptive management techniques (process, procedure, response), if appropriate, needed to achieve the desired outcomes; and review and reporting requirements and quality control standards.[105] The *Draft EMMP Guidelines* mention the need for three phases of monitoring throughout the process: validation monitoring prior to the project, compliance monitoring during the project, and long-term monitor following the completion of

[101] *Ibid* at Regulations 51, 52.
[102] *Ibid* at Annex IV, s. 11, Annex VII.
[103] *Draft EMMP Guidelines, supra* note 98 at Annex, at para 3.
[104] *Ibid* at section 26.
[105] *Ibid* at 6.

the project.[106] Monitoring should "validate assumptions made in the baseline/EIA/EIS phase of the project,"[107] but it remains unclear when and how long this validation monitoring will be conducted and what happens if validation monitoring proves that assumptions are invalid. The most comprehensive list of items to be included in baseline monitoring remains in the *Draft EIA Standard*. There is a lack of inclusion of criteria throughout the *Draft EIA Standard and EIS Guidelines* regarding compliance and long-term monitoring plans, despite these being included in the *Draft EMMP Guideline* and considered integral and critical aspects of a complete EIA.[108] The *Draft EMMP Guideline* further does not contain any requirement to have insurance or financing in place for any environmental damage.

There is a notable discrepancy between the *Draft EIA Standard* and the *Draft EMMP Guideline.* While the *Draft EIA Standard* emphasizes calculating and minimizing risks while balancing trade-offs of the proposed project, the Draft *EMMP Guideline* establishes that the precautionary approach, as defined in Principle 15 of the *Rio Declaration*, shall be used throughout environmental management and monitoring, which encompasses establishing baseline environmental conditions which falls within the EIA process.[109] This approach prioritizes environmental preservation, even with a lack of full scientific knowledge of consequences, which is contradictory to the mitigation guidelines within this set of draft guidelines, where mitigation is defined as the "examination of alternatives to establish the most technically and economically feasible, safe, and environmentally sound approaches for achieving the project objectives."[110] The precautionary approach is mentioned at the scoping stage;

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[106] *Ibid* at 7.
[107] *Ibid* at 7.
[108] J M Harrington & Larry W Canter, "Planning environmental monitoring programs within the environmental impact assessment process" (1998) 55:4 International journal of environmental studies 305–331.
[109] Draft EMMP Guidelines, *supra* note 98 at 2; Draft EIA Guidelines, *supra* note 77.
[110] *Ibid* at Appendix I at 1, 4.

however, it is framed as a method of accounting for uncertainties present in this stage rather than as a guiding principle throughout the process.[111] Furthermore, the *Draft EIA Guideline* does not specify which impacts should be measured beyond broad psychochemical, biological, and socioeconomic categories. The lack of integration regarding guiding principles across the draft standard and guideline documents makes them difficult to use and compare.

6.1.2.3 Environmental Management

Draft Exploitation Regulation 46 affirms that a contractor shall implement and maintain an Environmental Management System ("EMS"), which is part of the overall management system applied by a contractor. The EMS includes the organizational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining environmental policy, goals and environmental performance, including in the case of environmental emergencies.[112] The EMS must deliver site-specific environmental objectives and standards, be capable of independent auditing by recognized and accredited organizations and permit effective environmental performance reporting.[113]

The *Draft standard and guidelines on the development and application of Environmental Management Systems* ("Draft EMS Standard") is designed to assist in developing an EMS for seabed mining.[114] An EMS's key ingredients include leadership by senior management, the environmental policy, assigning roles and responsibilities, and the scope of baseline data.[115] Further, the contractor applicant shall ensure that the EMS delivers site-specific environmental

[111] *Ibid* at 4.
[112] *Draft standard and guidelines on the development and application of Environmental Management Systems ISBA/27/C/7 (31 January 2022)* at Annex I, para 1.
[113] *Ibid*; *Draft Exploitation Regulations*, *supra* note 28 at Regulation 46.
[114] *Ibid* at Annex II, para 3.
[115] *Ibid* at paras 9, 10, 15, 20.

outcomes consistent with the EMMP and apply recognized standards and systems, including the International Organization for Standardization ("ISO") standards and guidelines.[116] A contractor shall undertake four key steps: identifying and understanding key issues of the operation that may have an impact on the marine environment, ensuring operations are planned and carried out in a systematic and controlled manner to minimize or eliminate harmful effects, monitoring activities to evaluate whether the results achieved, and identifying areas for improvement.[117]

ISO 14001 is a standard that recognizes environmental management systems to improve environmental practices and organizational effectiveness.[118] Literature shows an improvement in the rigour and effectiveness of environmental practices due to adopting the best environmental practices, better employee commitment, and improved management system follow-up through regular audits.[119] ISO 14001 does not impose a precise set of objectives or strategies or confine the objectives to a purely environmental and operational perspective.[120] Adopting ISO can lead to different outcomes unrelated to the Standard but dependent on a diverse implementation approach based on unique organizational and managerial aspects.[121] ISO 14001 lacks performance measurability and strategic vision.[122] It is a management tool that aids any firm, irrespective of size, sector or type, in identifying and controlling the impact of its activities,

[116] *Ibid*.
[117] *Ibid* at paras 3, 4.
[118] Weiqian Zhang, Weiqiang Wang & S Wang, "Environmental performance evaluation of implementing EMS (ISO 14001) in the coating industry: case study of a Shanghai coating firm" (2014) 64 Journal of Cleaner Production 205; Haitao Yin & Peter Schmeidler, "Why do standardized ISO 14001 environmental management systems lead to heterogeneous environmental outcomes?" (2009) 18:7 Business strategy and the environment 469.
[119] Olivier Boiral et al, "Adoption and Outcomes of ISO 14001: A Systematic Review" (2018) 20:2 International journal of management reviews: IJMR 411–432; Javier González-Benito & Óscar González-Benito, "Operations management practices linked to the adoption of ISO 14001: An empirical analysis of Spanish manufacturers" (2008) 113:1 International journal of production economics 60–73.
[120] Andrea Chiarini, "Setting Strategies outside a Typical Environmental Perspective Using ISO 14001 Certification" (2017) 26:6 Business strategy and the environment 844.
[121] Boiral et al, *supra* note 119.
[122] *Ibid*.

products, and services on the environment.[123] Organizations can adopt ISO 14001 to meet certification process requirements and comply with external pressures without implementing the means or internal measures needed to improve their environmental performance.[124]

Information theory helps guide this analysis.[125] The ISO 14001 standard and improved environmental management depend less on technical and managerial impacts and more on implementing practices to improve environmental performance.[126] While implementing an EMS can indicate good management, the existence of an EMS in itself is insufficient to ensure compliance with environmental or social requirements.[127] Moreover, ISO 14001 should be read in conjunction with the entire ISO 14000 family of standards, including ISO 14002, 14004, and ISO 14007 (Guidelines for determining environmental costs and benefits).[128]

Instead, Eco-Management and Audit Scheme regulation seems to be of more strategic value in achieving financial objectives and customer satisfaction and confidence in a supplier's EMS.[129] The Eco-Management and Audit Scheme is a better strategy for improving financial objectives as it allows measurability of environmental performance, including consumption and resource savings.[130]

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[123] ISO, *ISO 14000 Family, Environmental Management*, online: https://www.iso.org/iso-14001-environmental-management.html; ISO Standards, "Standards Guide" online: https://www.isostandardsguide.com/iso-14001/.
[124] Olivier Boiral & Jean-François Henri, "Modelling the impact of ISO 14001 on environmental performance: A comparative approach" (2012) 99 J Environ Manage 84 at 85.
[125] Marco Sartor et al, "ISO 14001 standard: Literature review and theory-based research agenda" (2019) 26:1 The Quality management journal 32–64.
[126] Boiral & Henri, *supra* note 124 at 85.
[127] IFC, *Managing Contractors' Environmental and Social Performance* (Washington, DC, 2017) at 3.
[128] ISO, *ISO 14002-1:2019 Environmental management systems — Guidelines for using ISO 14001 to address environmental aspects and conditions within an environmental topic area — Part 1: General,* ISO, *ISO 14004:2016 Environmental management systems — General guidelines on implementation*, online: https://www.iso.org/standard/60856.html, ISO, *Environmental management — Guidelines for determining environmental costs and benefits*, online: https://www.iso.org/standard/70139.html?browse=tc.
[129] Chiarini, *supra* note 120.
[130] *Ibid* at 850.

There is a lack of consistency between the *Draft EMS Standard* and those outlined in the *Draft EMMP Guidelines*. The largest discrepancy lies in the rigour of environmental policy objectives—the latter mandates using the precautionary approach. The former merely describes that the plan should include environmental objectives based on the seabed's status and should seek to minimize impacts identified in the EIA process.[131] While the *Draft EMS Standard* states the importance of delivering site-specific environmental outcomes to complement the EMMP, there is no further guidance on what physical, geological, biological, chemical, or sediment properties should be measured. Detailed guidance regarding what properties should be measured and how they are provided within the *Draft EMMP Guidelines* while defining the scope of site-specific environmental goals is left unclear within the EMS.

Further, there is no mention of including the ISO 14040 series of assessments, which are the lifecycle ISO standards.[132] Integrating the two standards into one coherent document would improve environmental monitoring. Incorporating guidelines for closure plans from the *Draft Exploitation Regulations* would allow applicants to create a comprehensive environmental monitoring plan for a project's entire lifespan. Creating a financial or social score for nature will be difficult without acceptable environmental threshold values or robust environmental baseline data. Other approaches will be required to integrate environmental and social values until the ISA creates these threshold values and sufficient baseline data is collected. Current EIA requirements do not align with the ecosystem approach and the approach to internalizing environmental costs, i.e., the polluter pays.

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[131] Draft EMMP Guideline, *supra* note 98 at Paras 79-84.

[132] ISO, ISO 14042: *Environmental management: Life cycle impact assessment,* ISO 14042:2000 (International Organization for Standardization, Geneva, Switzerland, 2000), ISO, Environmental management: *Life cycle interpretation,* ISO 14043:200), (International Organization for Standardization, Geneva, Switzerland), ISO, Life cycle assessment: *Goal and scope definition and inventory analysis,* ISO 14040:1997, (International Organization for Standardization, 1997).

6.1.3 Ecosystem Approach and Internalization of Environmental Costs

Mining was not directly addressed in the *Rio Declaration* or its companion *Agenda 21*.[133] Yet almost every nation has mining activity, with its importance varying with the resource endowment and state of development.[134] Mining activities typically cause impacts on land, water, the climate and the flora, fauna and people that depend on these resources.[135] Mining non-renewable resources requires significant capital and resources to retrieve minerals.[136] Mining can foster economic development by providing decent employment opportunities, business development, increased fiscal revenues, and infrastructure linkages.

The Ecosystem Approach to the Management of Human Activities is a holistic concept that aims to balance conservation, sustainable use, and fair and equitable sharing of natural goods and services benefits.[137] Internationally, the ecosystem approach to environmental management has emerged as the dominant paradigm for managing marine ecosystems, which aims to protect ecosystems' health, productivity, and resilience and the ecosystem goods and services valued by human beings. According to the *Convention on Biological Diversity* ("CBD"), "the ecosystem approach is a strategy for the integrated management of land, water and living resources that

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[133] UN, *Commission on Sustainable Development, Report on the Eight Session* (8 April 1999) U.N. Doc. E/CN.17/2000/EOCSOC, Supp. No. 7, online: https://sustainabledevelopment.un.org/content/documents/Agenda21.pdf; Sara Seck, "Human Rights and Extractive Industries: Environmental Law and Standards" Paper No 12 (Rocky Mt Min L Fdn 2016) at 7; UN, *Agenda 21: Programme of Action for Sustainable Development* (Rio de Janeiro, 14 June 1992) UN GAOR, 46th Sess., Agenda Item 21; UN Doc. A/CONF.151/26/Rev.1.

[134] IGM, *Background Document: Legal Framework of Environmental and Social Impact Assessment in the Mining Sector* 2019 (IGM: 2019).

[135] Glenn-Marie Lange, Quentin Wodon & Kevin Carey, eds, *The Changing Wealth of Nations 2018: Building a Sustainable Future* (World Bank Group, 2018) at 51, 54; Columbia Center on Sustainable Investment, *Mapping Mining to the Sustainable Development Goals: An Atlas* (UNDP, 2016) at 5.

[136] Orio Giarini, "The Riches of the Ocean for Humankind: Rethinking Value in Economics and Development" (2014) 2:2 CADMUS 142 at 150.

[137] Sabine Christiansen et al, "Towards an Ecosystem Approach to Management in Areas Beyond National Jurisdiction: REMPs for Deep Seabed Mining and the Proposed BBNJ Instrument" (2022) 9 Frontiers in Marine Science; Maila Guilhon, Francesc Montserrat & Alexander Turra, "Recognition of ecosystem-based management principles in key documents of the seabed mining regime: implications and further recommendations" (2021) 78:3 ICES journal of marine science 884; Jennifer T Le, Lisa A Levin & Richard T Carson, "Incorporating ecosystem services into environmental management of deep-seabed mining" (2017) 137 Deep-Sea Research Part II 486.

promotes conservation and sustainable use in an equitable way."[138] Ecosystem Management differs from conventional resource management in that it defines strategies for systems, not individual ecosystem components. An ecosystem approach should be adopted to effectively protect the marine environment from the harmful effects arising from seabed mining.[139] Under the *Convention on Biological Diversity*, conservation is fostered through establishing protected areas, conserving biodiversity, ensuring ecosystem restoration and rehabilitation, nurturing conditions conducive to conservation and sustainable use, respecting traditional knowledge relating to biodiversity, and creating financial and technical support mechanisms.[140] Financial support mechanisms include some form of payment and cost procedure.

The Ecosystem Approach is explicitly applied in the *Draft Exploitation Regulations*.[141] Further, in Regulation 44, the ISA shall:

> Apply the precautionary approach, as reflected in principle 15 of the Rio Declaration on Environment and Development, and the ecosystem approach to the assessment and management of risk of harm to the Marine Environment from Exploitation in the Area.[142]

Ecosystem services are generally characterized as supporting, provisioning, regulating, and cultural services, with an additional "option use value" category to capture future unknown and speculative benefits of individual ecosystem components or the whole ecosystem. [143] The ISA recommends adopting an ecosystem-based management ("EBM") approach to manage and monitor mining operations. Traditional approaches focused on the impact of human activities on ecosystem interactions, such as trophic relationships. Recently, mixed approaches have been

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[138] *Convention on Biological Diversity,* 1760 UNTS 79, 1992 at Article 2.
[139] ISA, *Collation of specific drafting suggestions by members of the Council* ISBA/26/C/CRP.1 (17 December 2019).
[140] *CBD*, *supra* note 138 at Article 8.
[141] *Draft Exploitation Regulations*, *supra* note 28 at Regulation 2.
[142] *Ibid* at Regulation 44.
[143] Kate J Thornborough et al, "Towards an Ecosystem Approach to Environmental Impact Assessment for Deep-Sea Mining" in (Cham: Springer International Publishing) 63 at 65.

developed incorporating ecosystem dynamics with social and economic perspectives and the drivers of human-generated pressures.[144] The incorporation of ecosystem-based management has been explicitly referenced for developing Regional Environmental Management Plans ("REMP"), such as for the CCZ.[145]

Internalizing environmental costs is found in Principle 16 of the *Rio Declaration*:

> National authorities should endeavour to promote the internalization of environmental costs and the use of economic instruments, taking into account the approach that the polluter should, in principle, bear the cost of pollution with due regard to the public interest and without distorting international trade and investment.[146]

Understanding the ecosystems' roles in delivering ecosystem functions and services can better evaluate their impact on Earth systems and develop effective strategies to sustain their integrity.[147] Valuing ecosystem services has not been extensively researched for seabed mining. A range of impacts on institutions and communities and biotic natural capital assets (including associated flows of ecosystem services) are not currently valued in markets and represent well-known externalities associated with the extractive sector. Valuation raises questions about whether the maximum willingness to pay to avoid harm or minimum willingness to accept compensation to agree to harm is a more appropriate property rights framework.[148] Within this framework, and in conjunction with the Common Heritage of Mankind, the preferred approach is using market values for the price of a resource bought and sold in a market, estimating the cost of averting behaviour related to an adverse environmental or social change, determining the replacement cost of the next best option, and estimating how the price of a marketed product

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[144] *Ibid* at 74.
[145] ISA, "Regional environmental management plans" online: https://www.isa.org.jm/protection-of-the-marine-environment/regional-environmental-management-plans/; TMC, *AMEC Technical Report Summary Initial Assessment of the NORI Property, Clarion-Clipperton Zone* (March 2021) online: https://www.sec.gov/Archives/edgar/data/1798562/000121390021033645/fs42021a2ex96-1_sustainable.htm at 288.
[146] Rio Declaration, *supra* note 11 at Principle 16.
[147] DOSI, *Sustaining Biodiversity Beyond National Jurisdictions: The Major Science Challenges*, Policy Brief (2018).
[148] Le, Levin & Carson, *supra* note 137.

changes as attributes of that product.[149] Thornborough et al. propose an 'option use value' for valuing biodiversity and ecosystem services.[150] Effective criteria need to appropriately represent the ecosystem and the functions and services it provides. They require significantly more baseline data.[151]

However, both methods proposed require underlying market values, which still depend on the value of the ore, which is insufficient in seabed mining. Companies and governments exaggerate these greatly by not considering environmental and social externalities. A valuation code that considers these ecosystem service values would help calculate the potential economic benefits of a mining project. A better understanding and knowledge of the deep sea and its ecosystems will ensure rigorous area management and benefit all countries since all depend on the ocean to supply essential ecosystem services. Hidden environmental and especially social costs of mineral extraction are typically underestimated or not estimated in monetary terms, even though these may greatly offset mining activities' real or perceived economic benefits.[152] It also underestimates or ignores equity concerns.

6.1.4 Intergenerational and Intragenerational Equity

Equity, including intergenerational equity, provides the context in which sustainable development is supposed to occur. According to the *Rio Declaration*: "[t]he right to development must be fulfilled so as to equitably meet developmental and environmental needs of present and future generations."[153] Intragenerational equity is concerned with equity between people of the

[149] *Ibid* at 493.
[150] Thornborough et al, *supra* note 143 at 68.
[151] *Ibid* at 76.
[152] A Acosta, "Extractivism and neoextractivism: two sides of the same curse" in M Lang & D. Mokrani [eds] *Beyond development: alternative visions from Latin America*, vol 6 (Rosa Luxemburg Foundation and Amsterdam: Transnational Institute, Quito, 2013).
[153] Rio Declaration, *supra* note 11 at Principle 3.

same generation. It aims to assure justice among human beings alive today, as reflected in Rio Principle 6, mandating particular priority for the special situation and needs of developing countries, particularly the least developed and those most environmentally vulnerable.[154] Intragenerational equity attempts to achieve justice between 'rich' and 'poor' nations and Indigenous peoples.[155] Arrow et al. believe that scholars must accept that social well-being is the well-being of the current generation and the generations' potential welfare to follow.[156]

Development has three interrelated goals: sustainable scale, fair distribution, and efficient allocation.[157] Seabed mining converts mineral resources, an exhaustible or non-renewable natural resource, into financial assets that can generate other economic benefits, such as creating capital through investment in education and skills transfer. Intergenerational equity requires the current population to leave the environment in no worse condition so future generations can enjoy development.[158] Bourrel et al. believe equitable sharing will only be achieved if seabed resources are utilized while balancing all interests and considerations.[159] One element of intergenerational equity that will be addressed is climate change, while gender equality will be addressed for intra-generational equity.[160]

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[154] D. Shelton, "Chapter 1 – Equity" in *Oxford Handbook of International Environmental Law* (Oxford, 2008); Edith Brown Weiss, Intergenerational Equity, Oxford Public International Law, online: https://opil.ouplaw.com/display/10.1093/law:epil/9780199231690/law-9780199231690-e1421.
[155] Dire Tladi, "Intragenerational Equity: A New Name for International Environmental Justice" (2003) 9 Fundamina 197 at 198.
[156] Kenneth Arrow et al, "Sustainability and the measurement of wealth: further reflections" (2013) 18:4 Environment and Development Economics 504 at 505.
[157] Yale Insights, "What is ecological economics?", online: https://insights.som.yale.edu/insights/what-is-ecological-economics.
[158] Tladi, *supra* note 155 at 198, 203.
[159] Marie Bourrel, Torsten Thiele & Duncan Currie, "The Common Heritage of Mankind as a means to assess and advance equity in deep sea mining" (2018) 95:C Marine Policy 311 at 313.
[160] J K Summers & L M Smith, "Role of Social and Intergenerational Equity in Making Changes in Human Well-Being Sustainable" (2014) 43:6 AMBIO 718 at Table 1. There are countless others, however, for the purposes here, highlighting two will show that addressing environmental and social externalities is necessary in any sustainable seabed mining valuation code.

Climate change raises several questions about intergenerational equity risks those living today can impose on future generations and how available natural resources can be used without threatening the sustainable functioning of the planet's ecosystems.[161] The one that attracts the most attention is what obligations people have to future generations not to engage in activities that will trigger dangerous climate change and harm people in the near and distant future.[162] Estimating the opportunity cost of capital concerns environmental policy, as there may be a difference between the opportunity cost for durable goods and the opportunity cost for natural capital.[163] In international law, this means drafting agreements in such a way that they can respond to changes in scientific knowledge.[164] Climate change will also raise significant equity concerns between communities within future generations because the changes will likely produce more favourable climates in a few parts of the world and less favourable in many others. Valuing nature and the role of climate change by a nature pricing mechanism (see below) and requiring this valuation to be incorporated into the *Draft Exploitation Regulations* would ensure that the ISA takes intergenerational equity seriously.

Historically, mining has contributed to intra-generational problems, including displacement of populations, worsening economic and social inequality, armed conflicts, gender-based violence, tax evasion, corruption, health risks, and human rights violations.[165] Women account for less than forty (40) percent of human capital wealth because of lower earnings, lower

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[161] Edith Brown Weiss, "Climate Change, Intergenerational Equity, and International Law " (2008) 9 Vt. J. Envtl. L. 615; Fabian Schuppert, "Climate Change and Intergenerational Justice" (25 Oct 2012) online: https://www.unicef-irc.org/article/920-climate-change-and-intergenerational-justice.html.
[162] Simon Caney, "Climate change, intergenerational equity and the social discount rate" (2014) 13:4 Politics, philosophy & economics 320.
[163] Helen Scarborough, "Intergenerational equity and the social discount rate" (2011) 55:2 The Australian journal of agricultural and resource economics 145 at 148.
[164] Weiss, *supra* note 161 at 626.
[165] Sara Seck, "Indigenous Rights, Environmental Rights, or Stakeholder Engagement? Comparing IFC and OECD Approaches to the Implementation of the Business Responsibility to Respect Human Rights" (2016) 12:1 McGill Journal of Sustainable Development Law 48–91; David Szablowski, *supra* note 44.

labour force participation, and fewer average work hours.[166] Addressing, for example, non-paid work as a driver of human well-being is one factor.[167] Nations that achieve greater gender parity could generate a minimum of eighteen (18) percent increase in human capital wealth.[168] An important element of sustainable development recognizes that mining activities can impact men and women differently. Special attention should be paid to the role of women in artisanal and small-scale mining, their growing portion of employment in large-scale mining, and the adverse environmental and social impacts.[169] Poverty and environmental degradation are mutually reinforcing; poor people live in the most polluted or degraded environments.[170]

6.1.4.1 UNCLOS's Equitable Sharing Mandate

UNCLOS Article 82(4) gives the ISA the responsibility for distributing to State Parties based on "equitable sharing criteria." The ISA's Finance Committee noted that any distribution formulae developed concerning UNCLOS Article 140 could also be applied to distributions under Article 82(4), subject to agreement on the relative preference given to specific categories of States parties.[171] The ISA is considering two options. The first is a qualitative distribution of net financial benefits from seabed mining. This method is identified as a credible adjunct or alternative to simple financial distribution and arguably more in line with a precautionary approach.[172] The problem is that building sufficient revenue may take some years to make meaningful investments and is not favoured by the ISA.

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[166] Lange, Wodon, & Carey, *supra* note 135 at 126, 128.
[167] Summers & Smith, *supra* note 160.
[168] Lange, Wodon, & Carey, *supra* note 135 at 129–130.
[169] Pedro et al, *supra* note 64 at 162.
[170] Theo Henckens, *Governance of the World's Mineral Resources Beyond the Foreseeable Future* (Elsevier, 2021).
[171] *Ibid* at 14.
[172] ISA, ISBA/26/A/24 *supra* note 71 at 11.

A second and quantitative approach would be establishing the seabed sustainability fund and a mechanism for directly distributing royalties. This fund was identified in Chapter 5. It would be designed to invest in knowledge and competence related to the Area while at the same time addressing intergenerational equity and smoothing outflows of benefits in the face of fluctuating revenues. The balance of funds would be available for direct distribution.[173] The problem is ensuring sufficient funds for distribution and addressing environmental and social equity. This recommendation is before the ISA, with the finance committee due to provide recommendations for the 28th ISA Session, to be held in 2024.

Another approach is to use nature-based valuation or a social cost of carbon. The social cost of carbon is a dollar figure representing the estimated value of damages avoided per unit of carbon emissions reduced. It provides an economic valuation of the impacts of climate change.[174] For example, the social cost of carbon calculation could contribute to understanding the merits and drawbacks of proposed projects, particularly concerning economic dimensions and international climate change commitments. These environmental externalities and costs are detailed in the sustainable finance section below. However, environmental and social factors do not exist without stakeholders. In other words, various stakeholders must be informed and involved in making decisions ("public participation").

6.1.5 Governance, Public Participation and the Sustainable License to Operate

Good governance of public and private institutions is necessary for the sector's contribution to sustainability.[175] Governance can be defined as the formal and informal arrangements, institutions, and mores which determine how resources are utilized, how problems and

[173] *Ibid* at 12.
[174] Wright & Doelle, *supra* note 59.
[175] Eli Fenichel & Yukiko Hashida, "Choice and the Value of Natural Capital" (2019) 35:1 Oxford Review of Economic Policy 1207.

opportunities are evaluated and analyzed, what behaviour is deemed acceptable or forbidden, and what rules and sanctions are applied to environmental damage.[176] Governance must be cooperative and transparent, make information on investments in projects and their social, environmental and economic impacts (positive and negative) available to stakeholders and follow the precautionary approach.[177] The principles also go beyond the 'do no harm.'

It has long been recognized that governance is key for mitigating the adverse impacts of mining and for enhancing its positive economic, social and environmental outcomes. Decision-making in the extractive sector is shaped by a complex global, regional, national and local architecture of relationships between individuals and institutions. Diverse actors, normative frameworks, hierarchical relationships, and spatial and temporal boundaries characterize the extractive sector's governance. Stakeholders may include, but are not limited to, relevant international organizations and treaty bodies, regional fisheries management organizations, regional seas arrangements, and relevant intergovernmental and non-governmental organizations.[178] This process requires good governance in managing the revenue streams from mining investments, such as foreign capital inflows, royalties, licence fees, direct and indirect tax revenues, and infrastructure investment.[179]

The social licence to operate is the idea that mining firms must gain and maintain the cooperation and support of the communities in which they operate. Without community buy-in, mining projects can suffer costly delays and reputational damage that hamper a firm's ability to

[176] Honourable Charles Gonthier, "Sustainable Development and the Law" (2005) 18:1 McGill JSDLP 11; MIDAS, *Implications of MIDAS Results for Policy Makers: Recommendations for Future Regulations*, Grant Agreement No. 603418 (2016); DOSI, *Envisioning its Application to Marine Areas beyond National Jurisdiction (ABNJ)*, Policy Brief.
[177] See Sustainable Blue Finance Principles 7, 8, 10, 13, 14, *infra*.
[178] *Protocol on Strategic Environmental Assessment to the Convention on Environmental Impact Assessment in a Transboundary Context* (Kyiv, 21 May 2003) UNTS vol. 2685, p. 140; Doc. ECE/MP.EIA/2003/2.
[179] *IGF Mining Policy Framework, Mining and Sustainable Development (October 2013)* at 4.

attract employees or investors. Social license issues have evolved into critical business success factors.[180] Social license is a serious business for companies whose activities impact the environment and economy of local communities, particularly in unstable areas.

However, policy frameworks and instruments governing the mining sector tend to present piecemeal efforts and often fail to be implemented domestically. Further, the term 'licence' has been seen as misleading as it suggests the granting of specific permission for or public acceptance of a mining project, even if the reality is one of reluctant tolerance or absence of overt opposition.[181] Moreover, using the term 'social' may exaggerate diverging opinions among a diverse or heterogeneous group of stakeholders. Third, and as its name suggests, the social licence to operate focuses mainly on the social dimension of mining projects, with less attention paid to the environmental component. Finally, sustainable development is impeded by an incomplete accounting of sector impacts on comprehensive wealth (which is defined and discussed in the Sustainable Finance section below.[182]

There is a movement by the United Nations Environment Programme ("UNEP") to move beyond the social license to operate to a new governance model that enables public, private, and other relevant actors in the extractive sector to help shape the decision-making process. UNEP suggests replacing the "social license to operate" with a "sustainable development license to operate."[183] In September 2017, the International Resource Panel of the United Nations Environment Programme sought feedback concerning their efforts to formulate a new

[180] Lise-Aurore Lapalme, *The Social Dimension of Sustainable Development and the Mining Industry* (Natural Resources Canada, 2003).
[181] Pedro et al, *supra* note 64 at 155.
[182] *Ibid* at 156.
[183] UNEP, *Mineral Resource Governance in the 21st Century Gearing Extractive Industries Towards Sustainable Development* (2020) at 8.

governance framework entitled the Sustainable Development Licence to Operate.[184] This effort intends to set out clear principles, policy options and best practices to function as a common reference point, enabling all public, private and other relevant actors in the extractive sector to make decisions compatible with sustainable development.[185] Sustainable development, through this new 'license," would be relevant to all actors in the extractive sector. Its implementation is a shared responsibility of 'host' and 'home' countries along the extractive value chain. [186] The Social Development License to Operate attempts to integrate the pillars of people, planet, prosperity, peace and partnership by advocating for equal stakeholder benefits and a holistic consideration of existing mining sector regulations. The Sustainable Development License to Operate mainstreams environmental assessment, domesticates natural capital accounting (discussed in the Sustainable Finance section), ensures transparency, and channels extractive rents into public investment. Further inroads have to be made to increase transparency in several areas across the value chain, including mining contracts and licences, social and environmental impact assessments, royalties and tax payments at the project level, as well as State Enterprises, sovereign wealth funds and ownership of mining companies.[187]

The Sustainable Development License to Operate incorporates frameworks such as the UN Guiding Principles on Business and Human Rights, the Extractive Industry Transparency Initiative, the Global Reporting Initiative, initiatives for responsible mining (Towards Sustainable Mining Initiative), and the broader work of the International Council on Mining and

[184] UNEP, *Towards a Sustainable Development Licence to Operate for the extractive sector,* Consultation Paper, (September 2017) online: https://discovery.ucl.ac.uk/id/eprint/10022692/1/SDLO%20Consultation%20Paper%2002Oct17.pdf.
[185] *Ibid*.
[186] WRF, "Swiss Environment Director Chardonnens Calls for Strong International Resources Governance) (18 October, 2019) online: https://www.wrforum.org/events/wrf-events/swiss-environment-chardonnens-international-resources-governance/.
[187] Pedro et al, *supra* note 64 at 160.

Metals ("ICMM") Mining Policy Framework. These initiatives are thus set out in a separate section below. It also includes international agreements, national legislation and standards of practice, including, potentially, the work of the High Level Panel for a Sustainable Ocean Economy and the *Sustainable Blue Economy Finance Principles*. These frameworks and the idea of domesticating natural capital accounting are also essential elements for a sustainable seabed mining valuation code.

6.1.6 Polluter Pays

As noted earlier, Draft Regulation 2 refers to the polluter pays principle but does not elaborate on it.[188] The 'polluter pays' principle is the commonly accepted practice that those who produce pollution should bear the costs of managing it to prevent damage to human health or the environment. The polluter pays principle is part of the Rio Declaration and the Sustainable Development Goals.[189] The polluter pays principle is also part of international shipping regulations and international conventions on oil spills.[190] For example, it is part of Canadian law, such as the Canadian Environmental Protection Act and the Marine Liability Act.[191]

Of particular relevance is that the principle is designed to ensure that contractors bear the responsibility to pay for any environmental damage. One way to do this is to add a price on pollution. In other words, we would need to value the environment and add an environmental

[188] Draft Exploitation Regulations, supra note 28 at Regulation 2.
[189] Rio Declaration on Environment and Development, UNGAOR, UN Doc A/CONF.151/26 (Vol 1), Principle 16; see also Priscilla Schwartz, "Principle 16: The Polluter Pays Principle" in Jorge E Viñuales, ed, The Rio Declaration on Environment and Development: A Commentary (Oxford, UK: Oxford University Press, 2015) 426.
[190] Convention on Civil Liability for Damage Resulting from Activities Dangerous to the Environment (Lugano), 21 June 1993, 32 ILM 480 (not in force); Convention for the Protection of the Marine Environment of the North-East Atlantic, 22 September 1992, art 2(2)(b) (entered into force 25 March 1998); Convention on the Protection of the Marine Environment of the Baltic Sea Area, 22 March 1972, art 3(4) (entered into force 3 May 1980).
[191] Marine Liability Act (S.C. 2001, c. 6) Canadian Environmental Protection Act, 1999 (S.C. 1999, c. 33) Preamble, s. 287.

cost factor to a project's valuation. Craik notes that "cost internalization is often reflected in the inclusion of the polluter pays principle in international declarations and treaties."[192]

Cost internalization should be implemented not only in the valuation but also in the ancillary financial mechanisms, including the Environmental Compensation Fund (regulation 55), the Environmental Performance Guarantee, insurance and any Seabed Sustainability Fund.[193] In the event of environmental damage, in accordance with the polluter pays principle, the contractor shall be liable for compensation. Moreover, the lack of a closure plan prevents the full implementation of the polluter pays principle. The ISA must begin work on the Draft Closure Standard, as required under Draft Exploitation Regulation 59.[194]

6.1.7 Sustainable Development and the Oceans – a Sustainable Blue Economy

The High Level Panel for a Sustainable Ocean Economy ("High Level Panel") is an initiative in which effective protection, sustainable production and equitable prosperity go hand in hand. Co-chaired by Norway and Palau, the High Level Panel's membership represents a diverse group of regional, economic, and political perspectives, representing 40% of the world's coastline and 30% of the world's exclusive economic zones.[195] The High Level Panel recognizes the conflict of seabed mining as being part of a sustainable blue economy. On the one hand, they note:

> As an emerging industry in the ocean, deep-seabed mining is often considered as an example of the 'new blue economy.' It fits the blue economy definition of the EU Commission (i.e., all economic activities related to the ocean), but it remains to be seen if it will meet the World Bank definition (i.e., sustainable use of ocean resources for economic growth, improved livelihoods and jobs while preserving the health of ocean ecosystems).[196]

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[192] Neil Craik, *Determining the Standard for Liability for Environmental Harm from Deep Seabed Mining Activities,* CIGI Liability Issues for Deep Seabed Mining Series Paper No. 2 (CIGI, October 2018) at 2.
[193] See discussion in previous chapter.
[194] See Chapter 3.
[195] DFO, *High Level Panel for a Sustainable Ocean Economy*, online: https://www.dfo-mpo.gc.ca/international/hlp-ghn-eng.html (accessed 2 June 2022).
[196] Martin Stuchtey & Adrien Vincent, *Ocean Solutions That Benefit People, Nature and the Economy* (Washington, DC: High Level Panel for a Sustainable Ocean Economy) at 60.

Yet, the High Level Panel further adds:

> Until the need for, and potential consequences of, deep-sea mining are better understood, the concept is conceptually difficult to align with the definition of a sustainable ocean economy and raises various environmental, legal and governance challenges, as well as possible conflicts with the UN Sustainable Development Goals. It is not further discussed in this report.[197]

The High Level Panel calls for a precautionary approach to seabed mining.[198] The High Level panel does not call for a moratorium; instead, it calls for the ISA to ensure that seabed mining exploitation regulations effectively protect marine environments. This will involve applying a precautionary and ecosystem-based approach, using science-based and transparent management, ensuring effective compliance with robust inspection mechanisms, and publicly making the results from research and the analysis of research findings available.[199] Seabed mining requires transparent, responsible business practices that engage and benefit coastal communities, including small-scale fishers, full engagement of women in ocean activities to help unlock their economic and social potential, interests of coastal communities and rights of Indigenous Peoples and implement policies that require consideration of the particular importance of marine resources for these groups.[200]

Based on the final report of the High Level Panel, a conference entitled "*Transformations for a Sustainable Ocean Economy"* held in December 2020, outlined a set of priority ocean actions that countries can take to build a sustainable blue economy across five areas: ocean wealth, ocean health, ocean equity, ocean knowledge, and ocean finance.[201] As outlined in a discussion panel, *Ocean Protection Can Fuel a New Blue Economy and Drive Prosperity*, Canada's contributed to its potential to grow its blue economy and how it can drive sustainable

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[197] *Ibid* at 61.
[198] High Level Panel*, Transformations for a Sustainable Ocean Economy, 2020* at 10.
[199] *Ibid* at 12.
[200] *Ibid* at 16.
[201] High Level Panel for Sustainable Ocean Economy, "Leaders Commit to 100% Sustainable Ocean Management" online: https://oceanpanel.org/news/14-world-leaders-commit-100-percent-sustainable-ocean-management-solve-global-challenges (accessed 3 June 2022).

growth and reaffirm the work of the High Level Panel.[202] Canada's position on the marine environment and biodiversity protection has been reinforced by the Prime Minister's recent endorsement of the Transformations document from the *High Level Panel for a Sustainable Ocean Economy*, which includes a recommendation to slow the process of transitioning from exploration to exploitation and allow more time for scientific study, and appropriate scientific input into regulations and decision-making, including the development of environmental goals and objectives, and identification of science-based indicators and thresholds.[203]

Several ocean panel reports are germane to this dissertation. The first *Ocean Finance: Financing the Transition to a Sustainable Ocean Economy* argues that the sustainable finance gap needs to be closed by developing policies, incentives, tools and approaches and by proactively sharing capacities built to address environmental, social and economic risks.[204] The authors argue that current frameworks and taxonomies to guide which investments support 'blue' investments do not adequately communicate with each other and are not yet being guided by universally adopted principles.[205] Barriers to sustainable finance include a lack of a framework classification system for activities and gaps in significant ocean contributions to the economy that are not reflected in market prices.[206] More knowledge and understanding are needed on the transboundary nature or impacts on developing countries, especially for activities that generate negative externalities or are subsidized. Another gap is the inadequate payment and contributions towards ocean resources that underlie economic outputs, including the unequal

[202] DFO, "Canada commits to growing the blue economy at home and around the globe" online: https://www.canada.ca/en/fisheries-oceans/news/2020/12/canada-commits-to-growing-the-blue-economy-at-home-and-around-the-globe.html (accessed 3 June 2022).
[203] High Level Panel, "About Us" online: https://www.oceanpanel.org/about (accessed 1 June 2022).
[204] UR Sumaila, *Ocean Finance, Financing the Transition to a Sustainable Ocean Economy* (Washington, DC: World Resources Institute, 2020) at 2.
[205] *Ibid* at 6.
[206] *Ibid* at 7.

distribution of costs and benefits and the higher risks in ocean investments that require an enabling regulatory framework.[207] Effective guidelines must be widely adopted to guide investment decisions and development policy toward a sustainable ocean economy. An essential element of this emerging finance ecosystem will also be the creation of ocean-based finance taxonomies. This will involve creating classification systems of activities that comply with strong principles for a sustainable ocean and will allow decision-making processes and activities to adapt to new knowledge of the potential risks, cumulative impacts and opportunities.[208] Information on the status of the natural asset being invested in is required to meet rigorous criteria in a project's due diligence phase. Understanding and designing policies to deal with the negative effects of externalities is needed.[209]

Redirecting existing finance to more sustainable development pathways requires the public and private sectors to create and better mobilize a full suite of financial tools and approaches, insurance, and fiscal and market incentives.[210] We need to align international standards for ocean accounting and best practices for implementation as soon as possible to develop and ensure interoperability, harmonization and coherence of ocean accounts and to align with the Sustainable Blue Economy Principles.[211] Society should account for the status of the natural wealth of the ocean—the most important measure of progress towards sustainability of the ocean economy.[212] Fenichel et al. argue that valuation helps determine if the benefit stored in

[207] *Ibid* at 3.
[208] *Ibid* at 11.
[209] *Ibid* at 18.
[210] *Ibid* at Executive Summary.
[211] *Ibid* at 6.
[212] Eli Fenichel, Ben Milligan & E. Northrop, *Without the Ocean, National Accounts Are Incomplete (WRI, 2020)* at 3.

the ocean changes through time and helps calculate the expected net present value associated with current and alternative ocean management.[213]

Questions include how income is generated in an ocean sector interconnected with other ocean and non-ocean income and how changes in ocean policy could impact tax revenue.[214] The condition of ocean natural assets influences the valuation of produced ocean assets. Excluding natural assets runs the risk of misvaluing produced ocean assets.[215] Environmental valuation must include valuing natural ocean assets. In separate work, which will be comprehensively detailed below, Fenichel created the capital pricing model for nature, which works at the project or company level of valuing natural capital assets. The CAPn model, or one like it, will help create environmental values for a seabed asset valuation code.

The United Nations Environment Programme proposed the *Sustainable Blue Economy Finance Principles* from the discussions at the High Level Panel's Transformation conference.[216] The *Sustainable Blue Economy Finance Principles* define a sustainable blue economy as one that "provides social and economic benefits for current and future generations; restores, protects and maintains diverse, productive and resilient ecosystems; and is based on clean technologies, renewable energy and circular material flows."[217] The blue economy is based on circularity, collaboration, resilience, opportunity and interdependence.[218] Designed to build on and complement existing sets of principles for sustainable finance, such as the *Equator Principles*

[213] Eli Fenichel, et al., *National Accounting for the Ocean and Ocean Economy* (Washington, DC: World Resources Institute, 2020) at 2.
[214] *Ibid* at 11.
[215] *Ibid* at 34.
[216] UNEP FI, *The Sustainable Blue Economy Finance Principles, online:* https://www.unepfi.org/blue-finance/the-principles/.
[217] *Ibid* at 11.
[218] *Ibid* at 17.

(discussed below), these 14 principles aim to fill the current gaps associated with a sustainable ocean economy.[219]

These 14 principles are designed to align with the *Sustainable Development Goals*, the *Convention on Biological Diversity* and approaches such as the polluter pays, inclusiveness and human rights, knowledge and best science and data, legality with UNCLOS, precaution, protection of the environment, resilience, solidarity and sustainability. The principles promote SDG14 (Life Below Water) and set out ocean-specific standards, allowing the financial industry to mainstream the sustainability of ocean-based sectors. Investors should finance activities that contribute directly to SDG14 and support investments beyond avoiding harm to provide our ocean's social, environmental, and economic benefits for current and future generations.[220]

The Principles are designed to protect and support investments and projects that take all possible measures to restore, protect or maintain the diversity, productivity, resilience, core functions, and overall health of marine ecosystems and the livelihoods and communities dependent upon them.[221] They support investments, activities and projects compliant with international, regional, national legal and other relevant frameworks that underpin sustainable development and ocean health and base investment decisions on holistic and long-term assessments that account for economic, social and environmental values, quantify risks and systemic impacts and adapt processes and activities to reflect new knowledge of the potential risks.[222] Further, projects should identify systemic and cumulative impacts of investments and projects across value chains, support activities and projects that enhance local livelihoods, and

[219] The Equator Principles are described in the Sustainable Finance Section below.
[220] *Sustainable Blue Economy Finance Principles*, *supra* note 216 at Principles 9, 11, 12.
[221] *Ibid* at Principle 1.
[222] *Ibid* at Principle 2.

engage effectively with relevant stakeholders, identifying, responding to, and mitigating any issues from affected parties.[223]

Financial activity, including investment, insurance, banking and supporting intermediary activities in, or in support of, the development of a sustainable blue economy, most notably through applying the *Sustainable Blue Economy Finance Principles,* add to financial governance and decision-making, environmental, social and governance frameworks.[224] The goal is to de-risk, incentivize and monitor investment in sustainable ocean activities to increase transparency and ensure reporting consistency. Governance can be improved by promoting integrity across ocean governance and ocean industries, enforcing transparency and accountability, and enhancing domestic revenue administration through modernized, progressive tax systems, improved tax policy and more efficient tax collection.[225] Promoting transparent and open sharing and accessibility of ocean data is another key to the Principles.

However, the *Blue Economy Principles* do not integrate environmental or social considerations into financial calculations as they only create high-level principles, leaving significant gaps for financial institutions.[226] Sustainable mining frameworks and valuation codes integrated with wealth-based sustainability theory will form the basis for a sustainable seabed valuation code, as guidelines specific to sustainable mining and asset valuation codes will be required. In their concrete recommendations to financial institutions, the UNEP was clear that a

[223] *Ibid* at Principles 4, 5, 6.
[224] *Ibid* at 19.
[225] *Ibid* at 17.
[226] UNEP FI, *supra* at 183 for a gap analysis.

sustainable blue economy must exclude seabed mining as it is contrary to any principle of sustainable development.[227]

6.2 Critiques of Sustainable Development

> We have an opportunity to refocus our approach towards nature.[228]

Sustainable development in the context of minerals and metals is considered finding, extracting, producing, adding value to, using, reusing, recycling and, when necessary, disposing of mineral and metal products in the most efficient, competitive and environmentally responsible manner possible.[229] This involves utilizing best practices, respecting the needs and values of all resource users and considering those needs and values in government decision-making, maintaining or enhancing the quality of life and the environment for present and future generations, and securing the involvement and participation of stakeholders, individuals and communities in decision-making.[230] Mining offers the opportunity to catalyze broad-based economic development, reduce poverty and assist countries in meeting internationally agreed development goals. Mining activities could maximize social and economic benefits and effectively address negative environmental and social impacts.

However, there are critiques of the currently formulated definition of sustainable development. From a planetary boundary's perspective, UNEP "must aim to promote the

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[227] *Ibid* at 16- 17; The sustainable blue economy is a goal for the wider blue economy, and therefore excludes non-renewable extractive industries (e.g., offshore oil and gas, and seabed mining) as well as unsustainable practices in other sectors. Ecorys, *Unsustainable Finance in the Blue Economy: Where Does the Money Come From? Recommendations Report* (Prepared for European Commission, September 2021) at 12. The author finds it ironic that the European Commission is set against seabed mining, yet allows Belgium, Germany, France and the United Kingdom to be sponsoring states and active promotors of the nascent industry.

[228] K A Miller et al, "Challenging the Need for Deep Seabed Mining From the Perspective of Metal Demand, Biodiversity, Ecosystems Services, and Benefit Sharing" (2021) 8 Frontiers in Marine Science at 11.

[229] NRCan, "The Minerals and Metals Policy of the Government of Canada" (undated) online: https://www.nrcan.gc.ca/science-data/science-research/earth-sciences/earth-sciences-resources/earth-sciences-federal-programs/minerals-and-metals-policy-government-canada/8690 (accessed 14 June 2022).

[230] Lapalme, *supra* note 180 at 1.

coherent implementation of the environmental dimension of sustainable development, not 'sustainable development' as such."[231]

The Sustainable Development Goals and the language of sustainable mineral development suggest balancing environmental, social, and economic imperatives.[232] Economic growth patterns, especially in high-growth States like China, India, the United States, Brazil, and other nations with high population growth rates, are not sustainable because of a depletion of natural resources.[233] Moreover, most companies show no evidence of integrating the SDGs into their business strategy or corporate governance for companies, including mining companies.[234] Prioritization of SDGs often involves mapping SDGs to environmental issues prioritized in earlier materiality analyses.[235] According to a joint United Nations Development Programme, the World Economic Forum, the Columbia Center on Sustainable Investments and the Sustainable Development Solutions Network report, overall results are weak. There is little evidence of action on SDG 3 (Good Health and Wellbeing), SDG 5 (Gender Equality), SDG 6 (Clean Water and Sanitation) and SDG14 (Life Below Water).[236]

The launch of the UN Decade of Ocean Science for Sustainable Development (2021–2030) aims to catalyze a global focus to advance SDG14. It is based on the current sustainable

[231] *The Future We Want, UNGA Res. 66/288, U.N. Doc. A/Res/66/288 (11 September 2012)* at Annex; Rakhyun E Kim & Klaus Bosselmann, "Operationalizing Sustainable Development: Ecological Integrity as a Grundnorm of International Law" (2015) 24:2 Rev Euro Comp & Int Env Law 194–208 at 207; H Österblom, CCC Wabnitz, D Tladi, et al, *Towards Ocean Equity* (Washington, DC: World Resources Institute, 2020).
[232] Sara Seck & Anna Dolidze, "ITLOS Case No. 17 and the Evolving Principles for Corporate Accountability under International Law" in N Gal-Or, ed, *Responsibilities of the Non-State Actor in Armed Conflict and the Market Place: Theoretical and Empirical Findings* (Leiden: Brill, 2015) 235 at 238.
[233] Kenneth Arrow et al, "Sustainability and the measurement of wealth" (2012) 17 Environment and Development Economics 317 at 319.
[234] Columbia Center on Sustainable Investment, *Mining and the SDGs: A 2020 Status Update* (Responsible Mining Foundation, 2020) at 6, 24.
[235] These materiality analyses are similar to the issues found in disclosure problems of securities laws.
[236] Columbia Center on Sustainable Investment, *supra* note 234 at 5, 24, 25, 28.

development paradigm.[237] The "Five Pillars of a New Ocean Agenda" includes ocean wealth, health, equity, knowledge and finance.[238] Ocean Wealth is anchored in sustainable approaches to the ocean industry, such as low-impact tourism, ocean-based renewable energy and sustainable mariculture.[239] These principles underlie the High Level Panel work and the Sustainable Ocean Finance Principles.

The critiques of the SDGs and current ideas for sustainable development are based on the economic foundation upon which the SDGs rest. Most theories of sustainable development are inherently anthropocentric.[240] The illusion of infinite growth from a finite planet is uncovered.[241] In light of worsening global environmental conditions, there was a consensus on the need to pay greater attention to the environment. The sustainability challenges come from the needs of a growing population and aspirations for a higher quality of life. The International Panel on Climate Change notes that population and consumption growth in just ten developing countries represent 75% of all emissions growth over the past decade.[242] The scope, number and persistence of human needs and expectations stress the capacity of the environment to sustain society. Examples include unsustainable levels of industrial agriculture, forestry, fishing, urbanization, industrialization, and mass tourism.[243]

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[237] Brett Molony, Alex Ford, et al., "Sustainable Development Goal–14 - Life Below Water: Towards a Sustainable Ocean" (2022) 8 Frontiers in Marine Science Web.
[238] IOC/UNESCO, *Summary for Decision-Makers: A Blueprint for Ocean and Coastal Sustainability (*Paris: IOC/UNESCO, 2011), Ocean Networks Canada, *North-South Dialogue for a Sustainable Ocea*n (North-South Dialogue for a Sustainable Ocean, 26 February 2021); High Level Panel for a Sustainable Ocean Economy, *Transformations for a Sustainable Ocean Economy*, *supra* note 1 at 60.
[239] Olanike Adeyemo et al., "Informed Selfishness – Practical Reflections on Building a Sustainable Ocean Economy" (2021) 133 Marine Policy 104735.
[240] Sumudu Atapattu, Carmen Gonzalez and Sara Seck, ""Intersection of Environmental Justice and Sustainable Development, in Sumudu Atapattu, Carmen Gonzalez and Sara Seck The Cambridge Handbook of Environmental Justice and Sustainable Development (Cambridge, 2022) at 4–5.
[241] *Ibid* at 5.
[242] International Panel on Climate Change, "WG III contribution to the Sixth Assessment Report" online: https://report.ipcc.ch/ar6wg3/pdf/IPCC_AR6_WGIII_FinalDraft_Chapter02.pdf at 2-4.
[243] *Ibid* at 2-5.

Sustainable development, it is argued by some, cannot place humanity outside the environment.[244] The environment is now thought to be a floor on which the 'stool' of sustainable development lies rather than one of the legs of the stool.[245] This insight is important in understanding international law in sustainable development, how it is made, and by whom.[246] However, the author believes that even this is incorrect. Instead of the floor, the environment should be the 'seat' of the stool. All of the legs are components propping up the seat. Assuming this is a three-legged stool, the seat becomes unusable if one leg breaks. This way, the stool's 'economic' or financial leg must feed into and support the environment. In other words, the environment must have a valuation.

The new Sustainable Development Goals should incorporate environmental boundaries for planetary well-being.[247] According to the triple planetary crisis hypothesis/framework, humanity faces an existential triple threat crisis from climate change, loss of biodiversity, and pollution.[248] Biodiversity loss is a potentially significant threat. Economic activity and financial assets depend on the ecosystem services provided by biodiversity and the environment: this raises the prospect of physical risks to finance if these services are undermined. Mining assets can impact biodiversity and face risks from transitioning to a nature-positive global economy.[249]

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[244] Atapattu, Gonzalez and Seck, *supra* note 240 at 4.
[245] Barbara Cosens, "Social-Ecological Resilience and Its Relation to the Social Pillar of Sustainable Development" in Sumudu Atapattu, Carmen Gonzalez and Sara Seck [eds] *The Cambridge Handbook of Environmental Justice and Sustainable Development* (Cambridge, 2022) at 105.
[246] Lorenzo, *supra* note 9.
[247] Kim & Bosselmann, *supra* note 231.
[248] UNFCCC, "What is the Triple Planetary Crisis?" (13 April 2022) online: https://unfccc.int/blog/what-is-the-triple-planetary-crisis; UNEP, "The triple planetary crisis: Forging a new relationship between people and the earth" (14 July 2020).
[249] World Economic Forum, "What is nature positive and why is it the key to our future?" (23 Jun 2021) online: https://www.weforum.org/agenda/2021/06/what-is-nature-positive-and-why-is-it-the-key-to-our-future/ , Nature Positive, "A Global Goal for Nature" online: https://www.naturepositive.org/; WWF, "Financing a Nature Positive Global Economy" (WWF, 2021).

Climate change is a major driver of biodiversity loss, and key activities (such as land-use change and deforestation) contribute to both threats.[250] At the same time, healthy ecosystems provide resilience to growing climate shocks. As a result, biodiversity's physical and transition risks could interact and compound to generate systemic risks.[251]

The global wealthiest ten percent (10%) contribute about 36-45% of global emissions.[252] The global ten percent (10%) of the wealthiest consumers live on all continents, two-thirds in high-income regions, and one-third in emerging economies.[253] Developed countries consumption based emissions peaked in 2007, declining about fifteen percent (15%) by 2018. With fifty-two percent (52%) of the global population, Asia and the Developing Pacific region have contributed to consumption-based emission growth since 2000. It exceeds the developed countries region as the largest emitter of consumption-based carbon emissions.[254] Ten countries account for 75% of the growth in carbon emissions, and four of these ten countries (China, India, Russia, and Brazil) sponsor twelve (12) of the thirty-one (31) contracts issued by the ISA.[255]

How do we solve a planetary crisis when some strategies for mitigating climate change could negatively impact biodiversity? For example, mining for materials needed to develop renewable energy and battery storage technology and altering natural environments to build renewable energy infrastructure or plant crops for biofuel feedstock can harm biodiversity.[256] Land-based mining involves the destruction of ecosystems such as tropical rainforests,

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[250] *Ibid*.
[251] Network for Greening the Financial System, *Central banking and supervision in the biosphere: An agenda for action on biodiversity loss, financial risk and system stability*, Final Report of the NGFS-INSPIRE Study Group on Biodiversity and Financial Stability (2022) at 2.
[252] P.R. Shukla, et al., *Mitigation of Climate Change, (IPCC, 2022),* Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate (Cambridge University Press, 2022) at 2–7.
[253] *Ibid* at 2-8.
[254] *Ibid* at 2-5.
[255] ISA, "Exploration Contracts" online: https://www.isa.org.jm/exploration-contracts (accessed 10 June 2022).
[256] Holly Niner et al, "Deep-Sea Mining With No Net Loss of Biodiversity—An Impossible Aim" (2018) 5 Front Mar Sci 53.

particularly in emerging markets and developing economies, to facilitate these types of economic activities could trigger tipping points. Action to tackle climate change and build a net-zero emission economy needs to be placed in the wider context of sustainable development to avoid threats to biodiversity, for example, from poorly designed programmes for bioenergy or large-scale net-zero infrastructure that does not make provision for ecosystem health.[257]

Other planetary challenges include the unevenly distributed and finite nature of mineral deposits, the volatility of commodity prices, which have exposed developing countries to external shocks triggering macro-economic instability, the difficulties of managing large and volatile inflows of foreign capital, technical complexities of large-scale projects and limited national capacities, redefinitions of resource nationalism and the contours of the social licence to operate.[258] It is the change in ocean wealth, the value of all ocean assets, Fenichel argues, that is the most important indicator of whether a country's ocean economy is sustainable and capable of building wealth and economic opportunities for future generations.[259] Ultimately, current financial mechanisms omit important details regarding the ocean economy. Questions of intergenerational equity include whether the activity is making a country richer or poorer in the long term. In terms of intra-generational equity, how does ocean activity affect local communities and individuals? From an ecosystem service perspective, is the activity damaging ocean ecosystems or improving their health?[260]

Many ocean benefits are not traded on markets, and their values are thus far more difficult to assess. The set of nonmarket ocean benefits is very large and ranges from different

[257] Network for Greening the Financial System, *supra* note 251 at 19.
[258] N.A. Phelps, M. Atienza, & M. Arias, "Encore for the Enclave" (2015) 91 Economic Geography at 119; PwC, *Earning and maintaining social licence to operate* (PwC, 2021).
[259] Fenichel, Milligan & Northrop, *supra* note 212.
[260] *Ibid*.

ecosystem services to the broader category of nonmaterial contributions to people.[261] Nonmarket benefits include most of the ocean's cultural services (e.g., swimming, recreational fishing, observing sea life, and the existence value of the ocean's diverse biota). Ecosystem services include regulating services—the ocean's contribution to the global water, energy and chemical circulation systems, and the ocean's role in climate regulation, carbon dioxide (CO_2) uptake and coastal protection—typically not accounted for in existing markets.[262] A human rights approach reinforces notions of human separation from nature and even superiority over the rest of the ecological community.[263] Dolidze and Seck argue that mining companies do not take the human rights concerns of local communities seriously, and thus, there is a role for international normative standards to be developed.[264]

The controversy and debate around the sustainable ocean economy illustrate the disparities among visions of the way humanity should relate to the ocean— arguably the greatest common global resource.[265] A sustainable ocean economy should be aware of environmental and social limits on growth and consider degrowth where appropriate. Decoupling economic activity from carbon-intensive operations may necessitate additional mineral development. Yet, degrowth could lead to a moratorium and a potentially negative externality on common heritage. The ocean is becoming more unpredictable—the degradation of its health and ecosystem services is accelerating. There is no clear consensus on what would thus constitute shared value from mining; lack of accountability, transparency and risk of corruption; global asymmetries of power; conflicting stakeholder interests leading to social conflict; and lasting environmental

[261] Fenichel et al., *supra* note 213; Sumaila et al., *supra* note 204.
[262] S Gaines, R Cabral, et al, *The Expected Impacts of Climate Change on the Ocean Economy* (Washington, DC: World Resources Institute, 2019) at 3.
[263] Lynda Collins, "Revisiting the Doctrine of Intergenerational Equity in Global Environmental Governance" (2007) 30:1 Dal LJ 79 at 89.
[264] Seck & Dolidze, *supra* note 232 at 238, 259.
[265] Österblom, Wabnitz, Tladi et al., *supra* note 231.

damage.[266] The planetary boundaries framework places a greater emphasis on staying within the environmental ceiling over the social floor.[267] Can international law (including international sustainable development law) and the Common Heritage of Mankind be reconciled with an updated understanding of sustainable development?

6.2.1 Common Heritage

UNCLOS guarantees developing countries access to the seabed under the Common Heritage of Mankind through participation and benefit sharing.[268] For developing countries, benefit sharing and preferential treatment may include financial and non-financial benefits and equal participation.[269] The *1994 Agreement* acknowledged that seabed mining must foster benefits for humanity while being conducted under market principles.[270] At its core, it includes social, human rights, and environmental protection. It entails a redistribution of wealth, implying that an element of distributive justice is mandated.[271] Yet, according to Dingwall, it may be the component "ripest for reconceptualization in the modern era."[272]

Fragmentation theory holds that tensions may arise where commercial interests, including those of corporations and States, contradict sustainability. The SDGs and its predecessor, the Stockholm Declaration, were a compromise agreement between the competing interests of economic development and environmental protection.[273] Seabed mining could create more tension. It is touted as an environmentally safer method to transition to a low-carbon economy

[266] Pedro et al, *supra* note 64 at 155.
[267] Kim & Bosselmann, *supra* note 231 at 197.
[268] *UNCLOS*, *supra* note 26 at Articles 136, 139, 140, 148, 150, Annex III Article 139.
[269] Joanna Dingwall, *International Law and Corporate Actors in Deep Seabed Mining* (Oxford University Press, 2021) at 89.
[270] *Ibid* at 96.
[271] Rudiger Wolfrum, "the Principle of Common Heritage of Mankind" (1983) 43 Heidelberg J Int. L 312; Dingwall, *supra* note 269 at 91.
[272] Dingwall, *supra* note 269 at 92.
[273] Lakshman Guruswamy, "energy, poverty, justice and women" in Sumudu Atapattu, Carmen Gonzalez and Sara Seck [eds] *Cambridge Handbook of Environmental Justice and Sustainable Development* (Cambridge, 2022) at 379.

that can help millions of people escape poverty. How can we help developing States grow economically to alleviate poverty and ameliorate human rights while protecting the environment if that is what sustainable development should be?

Small island developing States are examples of this tension. The prospect of total submergence of small island States due to sea level rise associated with climate change raises multiple legal questions.[274] Several small island nation States (Nauru, Tonga, Kiribati, Jamaica, and the Cook Islands) are at the forefront of promoting seabed mining and economic development.[275] These countries do not have the financial resources to explore or exploit the seabed, so they have partnered with international corporations to conduct mining activities. A mutual co-dependence may ensue. Contractors cannot mine without a contract from the ISA. Many States cannot mine without private corporations acting as developers. A lack of transparency on corporate ownership makes it difficult to determine who is exercising effective control of the activities. Institutions are increasingly seen as stable states with various actors, like contractors, using their strategic interactions to modify the system.[276] Common management and non-appropriation are procedural elements managed by the ISA.[277] The differences between the Sponsoring State (the UK Seabed Authority) and private corporations (Lockheed Martin) are unclear. Transparency, good governance, and the open sharing of information may be implicitly included. Germany, France, China, Russia, and India use State Enterprises as contractors.

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[274] Sumudu Atapattu and Andrea Simonelli, "Climate Justice, Sustainable Development, and Small Island States" in in Sumudu Atapattu, Carmen Gonzalez and Sara Seck [eds] *The Cambridge Handbook of Environmental Justice and Sustainable Development* (Cambridge, 2022) at 434.
[275] ISA, "Exploration Contracts" online: https://www.isa.org.jm/exploration-contracts/polymetallic-nodules.
[276] Simon Deakin, "Legal Evolution: Integrating Economic and Systemic Approaches" (2011) 7:3 rle 659–683 at 661.
[277] Dingwall, *supra* note 269 at 88.

Non-renewable extraction involves highly capital-intensive operations that often do not generate many jobs or support livelihoods. The definition of the environment should extend to energy poverty and human rights. Effective participation in the *UN Framework Principles on Human Rights and the Environment* presents framework principles on human rights and the environment, addresses the human right to a healthy environment and looks forward to the next steps in the evolving relationship between human rights and the environment.[278] Environmental harm negatively impacts or infringes human rights law to protect against harm.[279] Obligations created include procedural obligations (duties to provide information, facilitate participation and provide access to remedies), substantive obligations (including regulating private actors and requirements for environmental impact assessments) and heightened obligations to those in particularly vulnerable situations.[280] It includes provisions to access effective remedies for violations of human rights and environmental laws by private and public actors, with no unjustified, foreseeable human rights infringements arising from biodiversity loss.[281]

The Common Heritage of Mankind, in principle, has been accepted as customary international law.[282] It may rise to the level of *jus cogens*.[283] However, specific obligations on potential seabed mining firms have not been established. In the 2011 *Seabed Advisory Opinion*, the SDC did not find any specific provisions mandating preferential considerations of responsibility or liability for developing States, citing the need to dissuade developed State

[278] UNHR, *Report of the Special Rapporteur on the issue of human rights obligations relating to the enjoyment of a safe, clean, healthy and sustainable environment* UN Doc. A/HRC/37/59 (24 January 2018).
[279] *Ibid* at 2.
[280] *Ibid* at 3.
[281] *Ibid* at 6; Elisa Morgera, "Participation at the International Seabed Authority: international law & interdisciplinary perspectives" One Ocean Hub, Presentation (5 May 2022).
[282] Dingwall, *supra* note 269 at 125.
[283] John E. Noyes, "The Common Heritage of Mankind: Past, Present, and Future" (2011) 40:1 Denver Journal of International Law & Policy 24; *Official Records of the Third United Nations Conference on the Law of the Sea* Vol. XIV U.N. Sales No. E.82.V.2 (1980) (statements of representatives of India, Trinidad and Tobago, Argentina, Iran, Jamaica, and Niger) at 52,58), 37(193), 42(T6), 71.

corporations from setting up shop in developing countries to benefit from preferential treatment and ultimately offending the uniform application of the highest standards of protection of the marine environment.[284] State regulation of seabed mining activities may become a source of customary law, especially where States demonstrate a degree of consensus on regulatory practices.[285] This obligation applies to activities under State jurisdiction or control (activities within the Area), the exercise of sovereign rights, and pollution from installations and devices used in seabed mining.[286]

The ISA uses market values for equitable compensation through its current mechanism of an Environmental Compensation Fund, a Seabed Sustainability Fund, and an Environmental Performance Guarantee. The market prices used to value these assets may provide misleading signals about the costs and benefits of land conversion. We are left with several options. The first, which may follow a degrowth pattern, would be enacting a seabed mining moratorium. However, with no mining, there would be no equitable sharing of any revenues, as there would not be any revenues. The second would be to allow seabed mining and have a simple compensation fund that passes along royalty payments to developing countries. The third is to value nature, embed the value into financial models and allow the decoupling of revenues from environmentally destructive practices. However, this would result in more minerals, potentially causing additional biodiversity concerns.

[284] *Seabed Advisory Opinion*, *supra* note 33 at para 159; Dingwall, *supra* note 269 at 12.
[285] *Seabed Advisory Opinion*, *supra* note 33 at 10, 72, 110, 112, 117, 131 242; 242.3; Danielle Amoroso, "Moving towards Complicity as a Criterion of Attribution of Private Conducts: Imputation to States of Corporate Abuses in the US Case Law" (2011) 24:4 Leiden JIL 989 at 990; Philippe Sands, Principles of international environmental law, 4th (Cambridge, 2018) at 51; Seck, *supra* note 133 at 90.; *Pulp Mills*, *supra* note 66.
[286] *UNCLOS*, *supra* note 26 at Articles 194, 208, 209.

6.2.2 The Need for Critical Minerals

The second main argument favouring seabed mining is that the world may "need" these critical minerals. The income generated from these assets can be invested into other assets, especially infrastructure and human capital, to build an economy and support long-term growth.[287] In the United States, the Biden administration cited a projected 400 to 600 percent increase in demand for critical minerals earlier this year to justify reducing reliance on foreign sources.[288] The administration enacted the *Inflation Reduction Act* in part to respond to this need.[289] A scenario analysis by Dominish, Teske and Florin expects demand for cobalt, lithium and nickel to exceed current mining reserves.[290] The issue is how much of an increase in metal demand will occur, whether we need additional virgin material, or whether a circular economy and additional recycling efforts can achieve this demand. Optimally, the ISA would only start production when global demand outstrips supply, which will not compensate for the land-based production or influence the pricing of minerals. Seabed mining is not expected to influence the prices of the minerals as volumes are not significant enough to move demand.

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[287] UNEP, *Accessing Global Resource Use: A systems approach to resource efficiency and pollution reduction,* Report of the International Resource Panel (UNEP: Kenya, 2017) at 8; OECD, "Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas" online: https://www.oecd.org/daf/inv/mne/mining.htm; IEA, "Sustainable and responsible development of minerals The Role of Critical Minerals in Clean Energy Transitions" online: https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions/sustainable-and-responsible-development-of-minerals; Verrier Brunilde et al., "Beyond the Social License to Operate: Whole System Approaches for a Socially Responsible Mining Industry" (2022) 83 Energy research & social science 102343.

[288] Ian Bickis, "Climate changed: Mining industry digs into alternative methods as risks rise" online: https://www.bnnbloomberg.ca/climate-changed-mining-industry-digs-into-alternative-methods-as-risks-rise-1.1835185; Mining.com "Almost unattainable gap between green energy copper demand and mining supply" (20 October 2022) online: https://www.mining.com/charts-almost-unattainable-gap-between-green-energy-copper-demand-and-mining-supply/; Wood MacKenzie, *Red metal, green demand Copper's critical role in achieving net zero* (October 2022).

[289] *Inflation Reduction Act of 2022*, H.R. 5376, Pub.L. 117–169; Reuters, "Biden awards $2.8 billion to boost US minerals output for EV batteries" (19 October 2022) online: https://www.mining.com/web/us-awards-2-8-billion-for-ev-battery-grid-projects/.

[290] Elsa Dominish, Sven Teske & Nick Florin, *Responsible minerals sourcing for renewable energy* (Earthworks - Institute for Sustainable Futures, 2019).

Furthermore, the minerals found on the seabed may have national security implications. The US Geological Survey ("USGS") has released the final list of 50 critical minerals (including Nickel, manganese, cobalt, lithium, and rare earth minerals) the domestic economy requires for economic and national security.[291]

The counterargument from a sustainable development perspective is that the growing push for a circular economy toward recycling metals adds a hurdle to mining the seabed.[292] All metals can be economically recycled at high rates. Even non-metal materials are increasingly recovered and reused at the end of the life of structures.[293] For countries dependent on non-renewables, the development challenge is twofold: recover rents from usually private (often foreign) operations and invest rents to build other assets.[294] The environmental degradation, biodiversity loss, displacement of populations, worsening economic and social inequality, armed conflicts, gender-based violence, tax evasion, corruption, health risks, and human rights violations caused by the extractive industry costs far outweigh the benefits.[295]

In 2020, the Secretariat of the ISA commissioned the preparation of a report to study the potential impact of mineral production from the Area on the economies of developing land-based

[291] US Geological Society, "2022 Critical Minerals List" online: https://www.usgs.gov/news/national-news-release/us-geological-survey-releases-2022-list-critical-minerals; US Department of the Interior, "*US Geological Survey 2022 Final List of Critical Minerals"* online: https://d9-wret.s3.us-west-2.amazonaws.com/assets/palladium/production/s3fs-public/media/files/2022%20Final%20List%20of%20Critical%20Minerals%20Federal%20Register%20Notice_2222022-F.pdf (accessed 15 May 2022).
[292] PM Haugan, L.A. Levin, et al., *What Role for Ocean-Based Renewable Energy and Deep Seabed Minerals in a Sustainable Future?* (World Resources Institute, 2020); White and Case LLP, "From trash to treasure: Green metals from recycling" (5 May 2022), online: https://www.whitecase.com/publications/insight/trash-treasure-green-metals-recycling (accessed 30 May 2022).
[293] *Ibid* at 21.
[294] Lange, Wodon, & Carey, *supra* note 135.
[295] Holly Niner and Kirsty McQuaid, "Defining the Environmental Impact Assessment Process for Deep-sea Mining (26 August 2021) online: https://oneoceanhub.org/defining-the-environmental-impact-assessment-process-for-deep-sea-mining/ (accessed 4 June 2022); A. Rogers et al. *Critical Habitats and Biodiversity: Inventory, Thresholds and Governance* (World Resources Institute, 2020) online: www.oceanpanel.org/blue-papers/critical-habitats-and-biodiversity-inventory-thresholds-and-governance.

producers of those minerals which are likely to be most seriously affected, intending to minimize their difficulties and assist them in their economic adjustment, considering the work done in this regard by the *Preparatory Commission*.[296] This study breaks down four 'critical' minerals: copper, cobalt, nickel and manganese, the same minerals valued in the MIT Group reports and those considered as part of the royalty regime noted in Chapter 5.

High growth rates of copper consumption are primarily associated with green technologies, electric vehicles and renewable energy.[297] Under most scenarios of copper consumption growth, land-based production and secondary metals will meet all the world's copper needs.[298] The volume of seabed mining copper will be invisible against the background of terrestrial mine production. Any copper competition may exclude the market of the least cost-effective operations, including contractors, hurting developing countries, although it is unlikely that seabed mining will have the lowest cost. Once secondary recycling of copper metal is factored in, the situation becomes even more tenuous. Currently, the end-of-life recycling rate for copper amounts to about fifty percent (50%), and recycled content is thirty percent (30%).[299] The growth of secondary copper production can offset capacity problems completely.[300] Seabed mining is not required for copper production and will not impact current projects.

The main center of cobalt mine production is the Democratic Republic of the Congo, accounting for approximately sixty percent (60%) of the world's production, while China is the

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[296] Lapteva Anna, Chernova Alexandra et al,, *Study of the Potential Impact of Polymetallic Nodules Production from the Area on the Economies of Developing Land-based Producers of those Metals which are Likely to be Most Seriously Affected* Advance Unedited Version (All-Russian Scientific-Research Institute of Mineral Resources: 2020).
[297] *Ibid* at 101. The fluctuations in forecasts are due to different expected growth rates of world GDP and population, "green technologies" development, shift to renewable energy sources, compliance with the Paris Treaty on measured regulation to reduce carbon dioxide in the atmosphere, and other factors.
[298] Ecorys, *supra* note 227 at 97, 100.
[299] *Ibid* at 87.
[300] Lapteva Anna, Chernova Alexandra et al., *supra* note 296 at 80, 94.

largest consumer.[301] Cobalt is a by-product of copper and nickel production, and any substantial new source will influence the market.[302] Price volatility, concerns about insufficient supplies, and human rights issues have led to changes in the composition of lithium-ion batteries, which are aimed at replacing cobalt or reducing its content.[303] If seabed mining starts, consumption growth will exacerbate the expected significant metal surplus in the market. Two seabed mining contractors will ensure the market entry of about five percent (5%) of the expected terrestrial production, whereas twelve contractors will provide approximately 30% of the expected ground production.[304] Products made from cobalt, as well as batteries, are suitable for recycling.[305] Recycling and secondary cobalt usage can dramatically lessen the need for virgin ore.[306] The resulting price level for cobalt could indicate that offshore mining is not economically viable and its start is not economically feasible. No seabed mining of this mineral is required.

South Africa is currently the world's largest producer of manganese ores, accounting for more than 27% of gross production.[307] The main factor determining the prospects of world manganese consumption is the dynamics of steel industry development, especially for housing,

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[301] Amnesty International, *"This is what we die for": Human Rights Abuses in the Democratic Republic of the Congo and the Global Trade in Cobalt* AFR 62/3412/2016.
[302] Lapteva Anna, Chernova Alexandra et al., *supra* note 296.
[303] Frik Els, "EV Metal Index jumps 85% in a month despite nickel, cobalt price drop" (18 May 2021), online: https://www.mining.com/ev-metal-index-jumps-85-in-a-month-despite-nickel-cobalt-price-drop/; Statista, Production volume of cobalt from mines worldwide from 2010 to 2020, online: https://www.statista.com/statistics/339759/global-cobalt-mine-production/#:~:text=In%202020%2C%20the%20total%20worldwide%20mine%20production%20volume,production%20volume%20of%2095%2C000%20metric%20tons%20in%202020; Fresh Energy, "What's up with the cobalt used in EV batteries? Electric car manufacturers are transitioning away from cobalt, a key component in lithium-ion batteries" (22 April 2021) online: https://fresh-energy.org/whats-up-with-the-cobalt-used-in-ev-batteries; Sam Shead, "Tesla plans to use Glencore cobalt in new Gigafactories" (16 June 2020) CNBC online: https://www.cnbc.com/2020/06/16/tesla-glencore-cobalt-gigafactory.html.
[304] Lapteva Anna et al., *supra* note 296 at 109, 111; Ecorys, *supra* note 227; AMEC Consultants, *supra* note 145.
[305] Elsa Olivetti et al, "Lithium-Ion Battery Supply Chain Considerations: Analysis of Potential Bottlenecks in Critical Metals" (2017) 1:2 Joule 229. André Månberger and Björn Stenqvist, "Global metal flows in the renewable energy transition: Exploring the effects of substitutes, technological mix and development" 2018 119C Energy Policy 226.
[306] World Bank Group, *supra* note 135 at 112.
[307] World Atlas, "Top 10 Manganese Producing Countries" online: https://www.worldatlas.com/articles/top-10-manganese-producing-countries.html (accessed 15 November 2022).

infrastructure construction, the automotive industry, battery manufacturers, and shipbuilding.[308] Any demand increase can be fully met by land-based production.[309] Only at an average annual growth rate of three percent (3%), a very unlikely scenario may entail an insignificant shortage of ore, which could stimulate price growth and intensify the development of new deposits.[310] If the price of nodules is higher than that of manganese ore from land-based mines, there will be no demand for manganese alloy and electrolytic manganese producers. [311] The use of steel scrap is growing, and recycling of steel and aluminum reduces the need for virgin ore.[312] As steel scrap contains manganese, its use in steelmaking reduces the need for virgin manganese products.[313]

Polymetallic nodules contain a high phosphorous content, a harmful impurity for raw manganese materials.[314] The technological and economic aspects of polymetallic nodule processing, particularly manganese-rich slag, require more careful consideration to determine if phosphorus can be eliminated from the ore.[315] Seabed mining of manganese is not required, as the exhaustion of raw material bases of industrial metals is a distant prospect.

Nickel is used in producing steel and electric batteries. Estimates indicate that demand for nickel will increase. [316] Until 2011, Russia, Canada and Australia remained the main

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[308] Lapteva Anna et al., *supra* note 296 at 137; World Bank Group, *supra* note 135.
[309] *Ibid* at 134.
[310] *Ibid* at 90.
[311] Avijit Biswal et al., "Electrolytic Manganese Dioxide (EMD): A Perspective on Worldwide Production, Reserves and Its Role in Electrochemistry" (2015) ChemInform Abstract RSC Adv. 5.
[312] Bourrel, Thiele & Currie, *supra* note 159.
[313] K. Hagelstein, "Globally sustainable manganese metal production and use" (2009) 90:12 J Environ Manage 3736.
[314] Anna, Alexandra et al., *supra* note 296; AMEC Consultants, *supra* note 145; Dominish, Teske & Florin, *supra* note 290.
[315] *Ibid* at 791.
[316] NRCAN, Nickel, online: https://www.nrcan.gc.ca/our-natural-resources/minerals-mining/minerals-metals-facts/nickel-facts/20519 OECD, *Global Material Resources Outlook to 2060: Economic Drivers and Environmental Consequences*, (OECD Publishing: Paris, 2019); Luca Maiotti and Benjamin Katz, *Interconnected supply chains: a comprehensive look at due diligence challenges and opportunities sourcing cobalt and copper from the DRC,* Tyler Gillard and Hannah Koep-Andrieu [eds] (OECD Centre for Responsible Business Conduct, 2019) at 82, 108.

producing regions, which provided about 40-45 % of the world's annual production.[317] The rapid production growth of low-quality deposits in Indonesia, the Philippines, New Caledonia, Brazil, Colombia, Cuba, and many other countries has become sources of raw materials for Chinese producers.[318] Since 2016, the nickel market has been in a state of deficit.[319] This situation may lead to a significant increase in metal prices. Six contractors will produce about 8% - 15 % of the surface mining expected commissioned.[320] Recycling of used batteries should increase. Recycling secondary nickel-containing raw materials is not developed properly and applies to stainless steel production.[321] These estimates show that seabed mining will only become a *de facto* nickel mining operation. This was a fear of Canada since the 1970s.[322] More importantly, seabed mining production could significantly negatively affect developing nations with land-based mining operations, resulting in serious adverse effects on developing countries' economies due to the closure of mine sites or the cancellation of new mine development.[323]

6.2.3 TMC and Sustainable Development

TMC has made the case that polymetallic nodules have the potential to supply critical metals like nickel and cobalt with potentially much less harm than sourcing them from beneath biodiverse rainforests and carbon sinks on land near human communities.[324] The SEC has taken issue with these claims:

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[317] Marcel Rozemeijer et al, "Seabed Mining" in Kate Johnson & Gordon Dalton, eds, Blue Growth and the New Maritime Economy (The Netherlands: River Publishers, 2018) at 104.
[318] RMG Consulting, *Comparative Analysis of Tax Regimes of Land-Based Mining in 15 Countries* (ISA, 2020); RMG, *Analysis of Tax Regimes in 15 Countries - Annex* (ISA, 2020) at 12.
[319] Elsa Dominish, Sven Teske & Nick Florin, *supra* note 290.
[320] *Ibid* at 806.
[321] Lapteva Anna, Chernova Alexandra et al., *supra* note 296; Smart Prosperity Institute, *Primary Materials in the Emerging Circular Economy: Implications for Upstream Resource Producers and Primary Material Exporters* (University of Ottawa, July 2021) at 4.
[322] Elizabeth Riddell-Dixon, "State Autonomy and Canadian Foreign Policy: The Case of Deep Seabed Mining" (1988) 21:2 Can J Pol Sci 297–317.
[323] Lapteva Anna, Chernova Alexandra et al., *supra* note 296 at 192.
[324] The Metals Company/SOAC, *Investor Presentation* (2021) at 4.

> You disclose that DeepGreen believes that it is positioned to become one of the lowest ESG footprint metal companies in the industry, offering an expected 70-99% reduction of most lifecycle ESG impacts. Please define what you consider lifecycle ESG impacts and your basis for your belief that DeepGreen will achieve a 70-99% reduction in such impacts. Please also address any limitations to this belief. For example, in terms of per-kilogram emissions from DeepGreen's production, it appears this may be relative to land ore averages depending on if your contractor does not use hydropower or another renewable source to process the nodule.[325]

In their response, TMC considers lifecycle impacts as the basis for DeepGreen's belief that it will achieve a 70-99% reduction in such impacts and describes the limitations of such belief, such as the commitment to locate its onshore processing facilities in places with access to renewable power.[326] The SEC was not convinced:

> We note your disclosure that you cannot predict whether the environment and biodiversity is impacted by your activities, and if so, how long the environment and biodiversity will take to recover. In this regard, please also disclose here and related disclosure about your impact on disturbed seabed that you have discussed in other publications. For example, available information on your website notes that restoring disturbed seabed to its pre-collection state on human timescales presents substantial scientific and logistical challenges and that in terms of the extent to which residual nodule cover (expected at 15% of nodule mass) will aid recruitment and recovery of these species in impacted areas, the process will likely take a very long time and is dependent on habitat connectivity, still under study.[327]

TMC conceded that the NORI data shows that "very few faunal groups return to baseline or control conditions after two decades."[328] TMC was then forced to revise its disclosure, adding limitations, risk factors, and uncertainties in calculating the relative impacts and benefits from seabed mining and describing further the potential impact on biodiversity as the most significant potential impact.[329] The SEC was not satisfied:

> Revise to further explain and provide supplemental support for your claim that "as compared to land-based sources, polymetallic nodule collection has many advantages that allow DeepGreen to reduce the potential

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[325] SEC, *Letter to SOAC re Amendment No. 1 Registration Statement on Form S-4 filed May 27, 2021* (16 June 2021) online: https://www.sec.gov/Archives/edgar/data/1798562/000000000021007463/filename1.pdf.
[326] D Paulikas et al., *Where Should Metals for the Green Transition Come From* LCA White Paper (April 2020); Paulikas et al, "Life cycle climate change impacts of producing battery metals from land ores versus deep-sea polymetallic nodules" (December 2020) The white papers are available online: https://metals.co/research and https://www.sciencedirect.com/science/article/pii/S0959652620338671.
[327] SEC, *Letter to SOAC Re: Sustainable Opportunities Acquisition Corp. Amendment No. 3 to Registration Statement on Form S-4 Filed July 14, 2021 File No. 333-255118* (2021) at 1–2.
[328] AMC Consultants, *supra* note 145 at 153. SEC, *Letter to SOAC re Amendment No. 1 Registration Statement on Form S-4 filed May 27, 2021* (16 June 2021) online: https://www.sec.gov/Archives/edgar/data/1798562/000000000021007463/filename1.pdf.
[329] SOAC, *Letter to SEC Re: Sustainable Opportunities Acquisition Corp. Amendment No. 3 to Registration Statement on Form S-4 Filed July 14, 2021* (28 July 2021) online: https://www.sec.gov/Archives/edgar/data/1798562/000121390021039155/filename1.htm.

> environmental and social impact of primary metal production, including the potential for up to a 90% reduction in climate change impacts." Please also disclose any material assumptions which underlie this statement.[330]

TMC then further explains and describes the support for the claim and references the material assumptions underlying the supplemental support and material assumptions.[331] The SEC mandated TMC revise its disclosure documents to indicate that certain executive officers of DeepGreen co-authored the papers and clarify the lifecycle impacts from studies commissioned and co-authored by DeepGreen. [332] TMC complied.[333]

The SEC continues to challenge their environmental claims by noting that disclosing known trends and uncertainties related to operations that might be impacted by environmental, climate and other governmental regulations for seabed mineral exploration and collection activities needed to be enhanced. TMC revised the disclosure to describe the known trends and uncertainties and updated their public filings to state that starting with NORI D, many steps are still required, including gathering biological baseline information and collecting data on environmental impacts.[334] As such, the SEC commented:

> Reconcile the statement that DeepGreen "can also move faster than land-based project developers" with your disclosures in the registration statement that "All phases of exploring for and collecting and processing polymetallic nodules will be subject to environmental regulation in various jurisdictions and under national as well as international laws and conventions. No seafloor polymetallic nodule deposit has been harvested on a commercial scale, and it is not clear what environmental parameters may need to be measured to satisfy regulatory authorities that an Exploitation Contract should be granted." We note that you have not

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[330] SEC, *Letter to SOAC re Amendment No. 1, supra* note 328.
[331] D. Paulikas, S. Katona, et al., "Life cycle climate change impacts of producing battery metals from land ores versus deep-sea polymetallic nodules," 2020 275 Journal of Cleaner Production 123822.
[332] SEC, *Letter to SOAC Re. Amendment No. 4 to Registration Statement on Form S-4 Filed July 29, 2021* (4 August 2021) online: https://www.sec.gov/Archives/edgar/data/1798562/000000000021009580/filename1.pdf at Form S-4 at 124.
[333] SOAC, *Letter to SEC Re Sustainable Opportunities Acquisition Corp. Amendment No. 4 to Registration Statement on Form S-4 Filed July 29, 2021* (5 August 2021) online: https://www.sec.gov/Archives/edgar/data/1798562/000121390021040481/filename1.htm.
[334] AMC Consultants, *supra* note 145 at 149. SEC, *Letter to SOAC, Re Amendment No. 1 Registration Statement on Form S-4 filed May 27, 2021* (16 June 2021) online: https://www.sec.gov/Archives/edgar/data/1798562/000000000021007463/filename1.pdf; *Prospectus Supplement No. 2, to Prospectus dated July 12, 2022, filed Pursuant to SEC Rule 424(b)(3) (15 August 2022)*, by TMC

> obtained any final regulatory approval or licenses for collecting and processing polymetallic nodules under the various jurisdictions and that there is no definitive timeframe to obtain such approval yet.[335]

TMC then replied and attempted to argue that the two statements referenced in the staff's comment are not inconsistent since they refer to different elements of the overall project timeline.[336] They argue that land-based mining projects typically require the construction of fixed infrastructure (e.g., new ports, power sources, roads, rail, freshwater, and worker housing) and resolution of other issues (e.g., Indigenous rights, community displacement, and forest removal), which leads to overall timelines that can exceed a decade.[337] By contrast, TMC claims the collection of polymetallic nodules requires "no fixed infrastructure to be built at sea and no local community issues" and, therefore, is expected to accelerate the timeline to commercialization as compared to land-based mining projects.[338] Comparing regulatory timelines for land-based mining is not an objective metric, and timelines vary significantly from one jurisdiction to the next.[339] TMC notes:

> Recovery of the target metals from the nodules will require onshore processing. The processing plant has not been designed, and its location and host country are not identified. However, NORI recognizes that onshore processing may have potential environmental impacts that should be formally assessed. A comprehensive environmental management plan will be developed during the Pre-feasibility Study Phase.[340]

TMC states that "most of the animals and their existing habitat will likely be removed by mining. The immediate loss at the local scale will be severe.[341] TMC admits that nodule

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[335] SEC, *Letter to Scott Leonard TMC, RE Amendment No. 2 Registration Statement on Form S-4 filed June 22, 2021* (9 July 2021) online; https://www.sec.gov/Archives/edgar/data/1798562/000000000021008527/filename1.pdf.
[336] *Ibid.*
[337] TMC was relying on an International Energy Agency's report titled "The Role of Critical Minerals in Clean Energy Transitions" online: https://iea.blob.core.windows.net/assets/24d5dfbb-a77a-4647-abcc-667867207f74/TheRoleofCriticalMineralsinCleanEnergyTransitions.pdf at 122.
[338] TMC, *Analyst Day presentation*, online; https://metals.co/investors/ at 69.
[339] SEC, *Letter to Scott Leonard TMC, RE Amendment No. 2 Registration Statement on Form S-4 filed June 22, 2021* (9 July 2021) online; https://www.sec.gov/Archives/edgar/data/1798562/000000000021008527/filename1.pdf
[340] AMC Consultants, *supra* note 145 at 291. SOAC, *Letter to SEC Re: Sustainable Opportunities Acquisition Corp. Amendment No. 2 to Registration Statement on Form S-4 Filed June 22, 2021* (13 July 2021) online: https://www.sec.gov/Archives/edgar/data/1798562/000121390021036769/filename1.htm
[341] SOAC, *Prospectus dated 22 October 2021* Registration No. 333-260126 at 199. ISA, *Recommendations for the guidance of contractors for the assessment of the possible environmental impacts arising from exploration for marine minerals in the Area* (ISBA/25/LTC/6; 2020).

extraction will impact the seafloor's fauna and overlying water column, stating that the NORI data shows "very few faunal groups return to baseline or control conditions after two decades."[342] TMC concludes that the return of the CCZ to its pre-impact state after the removal of nodules from the mined areas is not likely to occur within any foreseeable timeframe, given that nodule formation is believed to be in millions of years.[343] Hardly a low-impact activity.

6.3 Sustainable Mining Frameworks

> To adopt sustainable mining practices, more accurate valuation methods that separate the time value of money and risk are needed.[344]

Seabed mining may then not be consistent with sustainable development as currently framed. How can, other than a moratorium, we align seabed mining with sustainability? Sustainable mining frameworks should use sustainable finance to create a sustainable seabed mining valuation code. This section will review three mining frameworks. The *Towards Sustainable Mining* initiative is a Canadian approach and integrates with the Canadian corporation and securities laws requirements previously discussed. The *IGF's Mining Framework* stems from the IGMM and IGF's work on sustainable development. The UNEP Principles on Tailings Management strives to achieve zero harm to people and the environment. The High Level Panel and the Sustainable Blue Finance Principles align with these initiatives.

6.3.1 Towards Sustainable Mining

The Canadian mining industry has acknowledged that mining firms must protect the environment and has launched the Towards Sustainable Mining ("TSM") initiative.[345] The Mining Association of Canada's TSM standard is a globally recognized sustainability program that

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[342] AMC Consultants, *supra* note 145 at 153.
[343] SOAC, *Prospectus supra* note 340.
[344] R David Espinoza & Javier Rojo, "Towards sustainable mining (Part I): Valuing investment opportunities in the mining sector" (2017) 52 Resources Policy 7–18.
[345] ENB, "15th AGM of the IGF" (8 October 2019) online: http://enb.iisd.org/igf/agm/2019/html/enbplus210num17e.html; Mining Association of Canada, *supra* note 6.

supports mining companies in managing key environmental and social risks. TSM was the first mining sustainability standard to require site-level assessments and is mandatory for all companies that are members of implementing associations. Towards Sustainable Mining is aligned with the UN Sustainable Development Goals.[346]

Eight critical social and environmental performance aspects are evaluated, independently validated, and publicly reported against thirty (30) distinct performance indicators.[347] These eight performance protocols include Aboriginal and community outreach, energy use and greenhouse gas emissions management, tailings management, biodiversity conservation management, safety and health, crisis management and communications planning, preventing child and forced labour and water stewardship.[348] These protocols will assist in adding sustainability metrics to a valuation code.

The *TSM protocol for Assessing Biodiversity Conservation Management Performance* establishes three performance indicators on corporate biodiversity conservation commitment, accountability, and communications, facility-level biodiversity conservation planning and implementation and biodiversity conservation reporting.[349] Facility-level plan or management system to manage significant biodiversity aspects is implemented. The facility-level plan or management system includes, at minimum, potential impacts/risks to biodiversity, specific objectives for significant biodiversity aspects are identified, and action plans are developed and implemented to address specific biodiversity objectives.[350] Additional information must be reported to obtain a score of A or AAA. This includes plans for enhancing biodiversity in areas

[346] TSM, *Towards Sustainable Mining and the UN Sustainable Development Goals*, online: https://mining.ca/wp-content/uploads/dlm_uploads/2022/06/TSM-and-UN-SDGs-2022.pdf.
[347] Mining Association of Canada, *supra* note 6.
[348] TSM, "Protocols & Frameworks" online: https://mining.ca/towards-sustainable-mining/protocols-frameworks/ (accessed 15 June 2022).
[349] TSM, *Biodiversity Conservation Management Protocol, 2020* (11 March 2020).
[350] *Ibid* at 7.

outside the facility's property, achieving national or regional recognition in biodiversity conservation and, importantly, conducting ecosystem service valuation.[351] However, reporting on biodiversity conservation must include internal reporting on conservation, which supports management decision-making processes at the facility, and routine public reporting on biodiversity conservation performance. Further, public reporting on biodiversity conservation is independently verified or reviewed to obtain a score of A, AA, or AAA. Feedback on biodiversity conservation reporting is actively sought and reported publicly.[352]

The requirements presented in the Global Industry Standard on Tailings Management (the "Tailings Standard"), first introduced in 2020, have been mapped to the current level A requirements for tailings management, water stewardship and community relationships already established in TSM.[353] The Water assessment protocol aims to guide facilities in evaluating water stewardship performance against TSM indicators. None of these factors are currently present in terrestrial mining valuation codes.[354]

Published in 2021, the TSM Climate Change Protocol represents a major update to the TSM Energy Use and GHG Emissions Management Protocol. It aligns with the Taskforce on Climate-Related Financial Disclosures (described below).[355] To achieve a score of AA or above, an operator must show a demonstrated corporate commitment to climate action consistent with the ambition to limit global warming to well below two (2)°C (above pre-industrial levels), with short- and long-term targets and actions planned to achieve these commitments. The company's risk management approach integrates processes for identifying, assessing and managing material

[351] *Ibid* at 9.
[352] *Ibid* at 11.
[353] TSM, *TSM Tailings Management Protocol, 2019* (20 March 2019).
[354] TSM, *TSM Water Stewardship Protocol* (15 February 2019).
[355] TSM, *Climate Change Protocol* (March, 2021) at 2.

climate-related risks and opportunities. The impacts of material climate-related risks and opportunities identified on additional aspects of business and strategy are identified, assessed and managed. A range of potential carbon price scenarios is used when developing strategies, evaluating, and making project decisions.[356] To achieve a AAA score, future major capital allocation decisions will consider alignment with societal ambitions to achieve net-zero emissions by 2050. A firm must agree to contribute to Scope 3 GHG emissions reductions. Importantly, in jurisdictions without a carbon pricing regime, the company applies an internal carbon price in standard financial analyses and materials demonstrating the above criteria are publicly reported annually.[357]

The TSM is not a valuation methodology. However, it can align with EIAs, specifically in highlighting Life Cycle Analysis and the variety of risks in a project.[358] Moreover, the circularity and recycling approach can lower costs and help build trust and support, gaining the social license.[359] But its key takeaway is that the TSM mandates carbon risk analysis, pricing analysis, valuation, and public disclosure.

6.3.2 UNEP Principles on Tailings Management

The Global Industry Standard on Tailings Management (herein 'the Tailings Standard') strives to achieve zero harm to people and the environment with zero tolerance for human fatality.[360] It also requires the disclosure of relevant information to support public accountability.[361] Principle 3 states that an operator shall use social, environmental, economic, and technical knowledge base

[356] *Ibid* at 4.
[357] *Ibid* at 5.
[358] J Jeswiet, "Including Towards Sustainable Mining in Evaluating Mining Impacts" (2017) 62 Procedia CIRP 494.
[359] Pamela Lesser, "The road to societal trust: implementation of Towards Sustainable Mining in Finland and Spain" (2021) 34:2 Miner Econ 175–186.
[360] UNEP & ICMM, *Global Industry Standard on Tailings Management* (August 2020) at 4.
[361] Stakeholders may include workers, trade unions, project-affected people or communities and their formal and informal representatives, national or local government authorities, politicians, religious leaders, civil society organisations and groups with special interests, the academic community, or other businesses.

elements to inform decisions throughout the tailings facility lifecycle, including closure.[362] Requirement 3.4 under Principle 3 affirms that a contractor updates the assessment of the social, environmental and local economic impacts to reflect a material change to the tailings facility or the social, environmental and local economic context.[363] If new data indicates that the impacts from the tailings facility have changed materially, including as a result of climate change knowledge or long-term impacts, the Operator shall update tailings facility management to reflect the new data using Adaptive Management best practices.[364]

Principle 15 requires public disclosure and access to information about the tailings facility to support public accountability.[365] Requirement 15.1, under Principle 15, requires a summary of material findings of the environmental and social monitoring programme, including

[362] Principle 3 of the Global Standard requires Free, Prior and Informed Consent which is defined as a mechanism that safeguards the individual and collective rights of indigenous and tribal peoples, including their land and resource rights and their right to self-determination. FPIC is considered to be an ongoing process of negotiation, subject to an initial consent. To obtain FPIC, 'consent' must be secured through an agreed process of good faith consultation and cooperation with indigenous and tribal peoples through their own representative institutions. The process should be grounded in a recognition that the indigenous or tribal peoples are customary landowners. FPIC is not only a question of process, but also of outcome, and is obtained when terms are fully respectful of land, resource and other implicated rights.

[363] Material is defined as important enough to merit attention or having an effective influence or bearing on the determination in question. For the Standard, the criteria for what is material will be defined by Operator, subject to the provisions of local regulations, and evaluated as part of any audit or external independent assessment that may be conducted on implementation.

[364] *Global Industry Standard on Tailings Management,* at 9. Adaptive management is defined in this guidance document as A structured, iterative process of robust decision-making with the aim of reducing uncertainty over time via system monitoring. It includes the implementation of mitigation and management measures that are responsive to changing conditions, including those related to climate change, and the results of monitoring throughout the tailings facility lifecycle. The approach supports alignment on decisions about the tailings facility with the changing social, environmental and economic context and enhances opportunities to develop resilience to climate change in the short and long term.

[365] *Ibid* at 23. This requirement includes impact assessments, defined as a decision-making and management support instrument for identifying, predicting, measuring and evaluating the impact of development proposals, both prior to major decisions being made, and throughout the lifecycle of a project. While impact assessments typically focus on a single project, assessments can be scoped at the landscape level, and consider strategic implications of a change. Depending on the context, the circumstances, and the issues at hand, impact assessments may be discipline-specific, or conducted as part of an integrated set of studies. Assessments can be conducted in advance of impacts, or retrospectively. In this context, impacts are consequences to people, built infrastructure or the natural environment caused by a tailings facility or its failure, including impacts to the human rights of workers, communities, or other rights holders and including sensitive ecological receptors and ecosystem services. Impacts can be positive or adverse, tangible or intangible, direct or indirect, acute, chronic or cumulative, and measurable quantitatively or qualitatively.

mitigation measures (Requirement 7.5). Requirement 15.3 requires committing to cooperate in credible global transparency initiatives to create standardized, independent, industry-wide and publicly accessible databases, inventories or other information repositories about the safety and integrity of tailings facilities.[366]

6.3.3 IGF's Mining Framework

The 2002 *Johannesburg Plan of Implementation of the World Summit on Sustainable Development* explicitly addresses mining, stating in part: "mining, minerals and metals are important to many countries' economic and social development," and "minerals are essential for modern living.[367] At the *World Summit on Sustainable Development* in 2002, many countries interested in mining decided to take action to ensure and enhance the contributions of mining to sustainable development and identify the priorities that needed to be addressed. As a result, the Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development ("IGF") was created and is the leading global intergovernmental policy forum on mining and sustainable development. The objectives of the IGF are to improve and promote the contribution of the mining, minerals and metals sectors to sustainable development and poverty reduction.[368]

The IGF's flagship policy guidance and assessment tool is the Mining Policy Framework ("MPF").[369] The IGF Framework lays out international best practices in six key pillars of mining policy and law: the legal and policy environment, financial benefit optimization, socioeconomic

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[366] *Ibid* at 24. Reclamation is defined as the process of restoring the mine site to a natural or economically useable state as provided in a reclamation plan. Reclamation results in productive and sustainable landscapes to meet a range of conditions that might allow for biodiversity conservation, recreational or agriculture uses, or various forms of economic development, whereas restoration is the process of assisting recovery of the social, environmental and local economic systems that have been degraded, damaged or destroyed.
[367] *World Summit on Sustainable Development* (Johannesburg, South Africa: 26 August 2002); *Report of the World Summit on Sustainable Development*: *Annex Plan of Implementation of the World Summit on Sustainable Development*, 46, U.N. Doc. A/CONF.199/20 (2002).
[368] IGF, *Mining Policy Framework* (October 2013).
[369] *Ibid* at 19.

benefit optimization, environmental management, mine closure and post-mining transitions, and artisanal and small-scale mining.[370] The IGF's Mining Environmental and Social Impact Assessment ("ESIA") Tool aims to help governments identify gaps in their legal and institutional capacity.[371] The IGF Secretariat underlined that the transition to a low-carbon economy would require a significant amount of minerals and metals.

The IGF asserts that a mature modern legislative regime provides clear lines of responsibility and accountability. Such a regime provides the foundation of good governance and contributes to sustainable development in all aspects of social and economic life.[372] Specifically, mining codes and standards must be revised and updated to reflect changing knowledge and best practices.[373] They should deal with all aspects of mining, from exploration to closure and post-closure management.[374] Data, reporting and integrated social, economic and environmental requirements should be explicit in exploration and operating licences so that authorities can make informed decisions.[375] Permit submissions should describe possible risks and impacts of the mining activities and proposed mitigation or management measures.

The IGF's strength is its global scope, but it has a regional focus.[376] The IGF strongly focuses on social assessment and the intersectionality of gender and equality.[377] The mining policy covers consultation and lifecycle planning, public engagement, financial support, social

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[370] IGF, "Legal and Policy Environment" online: https://www.igfmining.org/mining-policy-framework/framework/legal-and-policy-environment/.
[371] IGF, "IGF's Mining ESIA Tool (MET)" online: https://www.igfmining.org/our-work/environmental-and-social-impact-assessments/#MET.
[372] IGF, "Legal and Policy Environment" *supra* note 370.
[373] *Ibid*.
[374] *Ibid.*
[375] *Ibid*.
[376] Madagascar, *Mining Policy Framework Assessment: Madagascar* (IGF, 2018); IGF, *Designing Local Content Policies in Mineral-Rich Countries* (IGF, 2021); IGF, *Mining Rehabilitation in Papua New Guinea*.
[377] IGF, *Casualty or Catalyst: Gender Equality and the Future of Mining* (IGF, June 2019); IGF, *The Importance of Consultation and Engagement in Environmental and Social Impact Assessment* (March 2023); IGF, *Guidance for Governments: Environmental management and mining governance* (IGF, 2022); IGF, *Global Review: Integrating Gender Into Mining Impact Assessments* (October 2022).

impact assessment scoping, closure, grievance mechanisms, free prior and informed consent processes, environmental and social monitoring and waste management.[378] These frameworks are more fully developed than those by the ISA.

Moreover, the IGF has significant resources in mining finance and sustainability.[379] Tax treaties, royalty payment systems, classifying fiscal terms, and using multiple sources of law have detailed practice guidelines and notes to help contractors and governments value minerals and implement policy alternatives. The IGF Policies align with Canadian, Australian and South African valuation codes.[380] Finally, the IGF's processes on mine closure and reclamation are more robust than those of the TSM.[381] Governments need adequate financial assurance to achieve a successful post-mining transition.[382] The ISA does not yet have a standard, guideline, or comprehensive policy on mining closures for the seabed, nor does it have financial requirements. As such, the adoption by the ISA of enhanced closure guidelines is a necessary prerequisite before any regulations should be enacted.[383]

6.4 Sustainable Finance

The above frameworks call for enhanced valuations but do not provide the methodologies to calculate environmental and social factors. Sustainable finance can guide how to value nature, biodiversity and social factors. This subsection reviews several sustainable frameworks that

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[378] IGF, *Legal Framework of Environmental and Social Impact Assessment in the Mining Sector* (IGF, 2021; IGF, *Environmental Management and Mining Governance* (May 2021).
[379] IGF, *Training Workshop for UEMOA Member States Officials on Mining Economics* (July 2017); IGF, *Monitoring the Value of Mineral Exports: Policy Options for Governments* (IGF, 2021); IGF, *Protecting the Right to Tax Mining Income: Tax treaty practice in mining countries* (November 2021); IGF, *The Future of Resource Taxation: A Roadmap* (October 2020); IGF, *Insights on Incentives: Tax competition in mining* (2022).
[380] IGF, *Monitoring the Value of Mineral Exports*, *supra* note 374 at 34-35; IGF, *State of Sustainability Initiatives: Review Standards and the Extractive Economy* (IISD, 2018).
[381] IGF, *Guide to Financial Assurance for Mine Closure in Argentina: Toward responsible mine closure* (September 2019); IGF *Global Review: Financial assurance governance for the post-mining transition* (August 2021).
[382] IGF, *Financial assurance governance for the post-mining transition* (September 2021); IGF, Mining Project Rehabilitation and Closure Guidelines: Papua New Guinea (IISD, 2019).
[383] Keith MacMaster, "Sustainable Seabed Mining, the Phase 1 Environmental Standards and Guidelines" (2023) Australian Yearbook of International Law.

could assist with creating a sustainable seabed mining valuation code and updating land-based mining valuation codes. Information relevant to sustainable finance aligns with incentives, results measurement, proper valuation of assets, and effective risk management. Better information allows financial institutions and companies to incorporate nature-related risks and opportunities into strategic planning, risk management and asset allocation decisions.

International law allows non-state actors, such as multinational corporations and international financial institutions, to become sustainable development players.[384] International investors are increasingly calling for high-quality, transparent, reliable and comparable reporting by companies on climate, biodiversity and other environmental and social matters. Financial institutions have started to embed sustainability into their core strategies.[385] Financial institutions face material risks from environmental issues such as biodiversity loss and contribute to accumulating nature-related risks through their finance activities.[386] Sustainable finance has a critical role in the transition toward a low-carbon economy.[387] Interest in responsible or sustainable investing continues to grow as evidence shows that sustainability creates long-term value and contributes to a better environment, healthier communities, and good corporate practices. Sustainable investing attempts to turn the investment conversation from "is the project good for me" to "is the project good."[388] Integrating environmental costs into economic

[384] Lorenzo, *supra* note 9 at 331.
[385] UNEP, *Roadmap for a Sustainable Financial System* (UNEP, 2017) at 10.
[386] Network for Greening the Financial System, *supra* note 251 at 3, 42.
[387] Responsible Investment Association, *2020 Canadian Responsible Investment Trends Report*; Dominish, Teske & Florin, *supra* note 290; Keith MacMaster, "Responsible Investing: Access Denied" (2019) 34:3 Banking & Finance Law Review 387; Benjamin Richardson, "Socially Responsible Investing for Sustainability: Overcoming Its Incomplete and Conflicting Rationales" (2013) 2:2 TEL 311.
[388] *Climate Risk and Response: Physical hazards and Socioeconomic impacts*, by Jonathan Woetzel & Dickon Pinner (McKinsey Global Institute, 2020); Robin Warner, "Oceans in Transition: Incorporating Climate-Change Impacts into Environmental Impact Assessment for Marine Areas Beyond National Jurisdiction.(Oceans and Climate Change Governance)" (2018) 45:1 Ecology Law Quarterly 51; Stephen Kim Park, "Social Bonds for Sustainable Development: A Human Rights Perspective on Impact Investing" (2018) Business and Human Rights Journal 1.

instruments assists in valuing trendlines underlying crises such as climate change, biodiversity loss and rising inequality.[389] Principle 16 from the *Rio Declaration* asserts:

> National authorities should endeavour to promote the internalization of environmental costs and the use of economic instruments, taking into account the Approach that the polluter should, in principle, bear the cost of pollution with due regard to the public interest and without distorting international trade and investment.[390]

The pricing of natural capital and environmental costs has remained elusive, with financiers treating expenditures on conservation as costs rather than investments.[391] Valuing the environment remains crudely measured, and most financial models do not incorporate social and environmental factors.[392] Chapter 5 shows that the ISA has not incorporated environmental or social factors into the Mining Code's financial provisions.

6.4.1 Capital Asset Pricing for Nature

Capital traditionally takes raw natural resources and builds 'things' such as buildings, roads and factories. Minerals are transferred from one inventory (nature) to another (society). This transfer between inventories (the act of mining) is only the first essential step. Issues include optimizing employment opportunities of host or Sponsoring State nationals, requiring socioeconomic plans to be part of the permitting process, education and training, increasing levels of managerial responsibility and ensuring high occupational health and safety standards. This ensures that each company within its jurisdiction accepts corporate responsibility for occupational health and safety through an appropriate set of legal requirements and governmental monitoring, inspection and enforcement activities. There is a strong case for

[389] Tladi, *supra* note 155 at 204.
[390] Rio Declaration, *supra* note 11.
[391] Eli Fenichel et al, "Measuring the value of groundwater and other forms of natural capital" (2016) 113:9 PNAS 2382.
[392] MacMaster, *supra* note 387 at 48, 53; Eli P Fenichel & Joshua K Abbott, "Natural Capital: From Metaphor to Measurement" (2014) 1:1/2 Journal of the Association of Environmental and Resource Economists 1.

governing the extractive industries through laws and regulations dealing with natural capital rather than relying on negotiating extensive and complex individual mining contracts.[393]

Wealth-based sustainability theory focuses on changes in wealth, intertemporal welfare and human capital.[394] These changes should, at a minimum, include the technology effects when estimating movements in comprehensive wealth over time.[395] Wealth-based theory holds that natural resources should be treated and valued as capital assets.[396] This valuation requires integrating non-market forces and capital theory.[397] Growth requires the efficient use of natural capital and investing the earnings from natural capital sources, such as minerals, into infrastructure and education.[398]

Comprehensive capital measures scarcity and the shadow value of the stock *in situ*.[399] Comprehensive capital is the sum of produced capital (buildings, roads and factories), natural capital (healthy ecosystems and abundant resources), human capital (productive, well-educated citizens and valuing their work), financial capital (financial assets like stocks and bonds and contracts) and social capital (cooperative relationships built on trust).[400] For example, ideas around the circular economy, where all aspects of the economy are repurposed and reused, align well with recycling. At the same time, relatively high commodity prices also make the often resource-intensive process of sorting and processing scrap more economically viable.[401]

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[393] Shelley L MacDougall, "Confronting the financing impasse: Risk management through internationally staged investments in tidal energy development" (2017) 18 International Journal of Marine Energy 78 at 79.
[394] Lange, Wodon, & Carey, *supra* note 135.
[395] Arrow et al, *supra* note 233 at 321, 330.
[396] Fenichel et al, *supra* note 391 at 2382.
[397] Fenichel & Abbott, "Natural Capital", *supra* note 392 at 2.
[398] *Ibid*.
[399] *In situ* valuations are not acceptable in valuation codes, see Chapter 4 *supra*.
[400] Lange, Wodon, & Carey, *supra* note 135 at 43, 48, 49.
[401] Valentina Leotaud, Demand for green metals from recycling expected to grow (29 May 2022) online: https://www.mining.com/demand-for-green-metals-from-recycling-expected-to-grow-report/ (accessed 2022).

Yun, Fenichel and Abbott developed a theory of the capital asset pricing model for nature ("CAPn").[402] The CAPn theory holds that a natural capital asset price equals the contribution to ecosystem benefit/destruction divided by a discount rate adjusted for the overall effect on natural capital growth.[403] If increases in natural capital increase environmental degradation, the discount rate will be adjusted upward.[404] In other words, the more a project is environmentally destructive, the riskier it is; thus, the higher the discount rate and the lower the NPV of future losses and gains.

It is beyond the scope to recommend a specific environmental valuation theory. For example, decoupled net present value is used to evaluate mining investment opportunities. The proposed valuation method decouples the time value of money from the risk associated with the project.[405] The argument for decoupling value is based on the overreliance on current methodologies. It is nearly impossible to justify climate change reliance and adaptation investments to improve mining facility chances to withstand the effect of future significant weather events related to climate change.[406] Decoupling risk will help value long-term assets and liabilities, such as asset retirement obligations, climate change resilience and adaptation measures, and mine reclamation and post-reclamation care liabilities.[407]

Rather, the goal is to show that understanding the state of natural capital and human behaviour, mediated by markets, regulations, social norms, and other institutions that mould

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[402] Seong Do Yun, Eli Fenichel & Joshua K Abbott, *CAPn: Capital Asset Pricing for Nature* (2017); Fenichel & Abbott, "Natural Capital", *supra* note 385; Dale W Jorgenson, "Capital Theory and Investment Behavior" (1963) 53:2 The American Economic Review 247.
[403] Fenichel & Abbott, "Natural Capital", *supra* note 392 at 8; Brunilde Verrier et al, "Beyond the social license to operate: Whole system approaches for a socially responsible mining industry" (2022) 83 Energy research & social science 102343 at 3.
[404] Fenichel & Abbott, "Natural Capital", *supra* note 392 at 9.
[405] Espinoza & Rojo, *supra* note 344; David Espinoza & Jeremy WF Morris, "Towards sustainable mining (part II): Accounting for mine reclamation and post reclamation care liabilities" (2017) 52 Resources Policy 29–38.
[406] *Ibid*.
[407] *Ibid*.

behaviour, is imperative to valuation.[408] In other words, the law itself will affect finance. Moreover, there are tools and financial paradigms to base environmental and social valuation already in existence. One immediate consequence of this vision is the impossibility of the ISA ignoring environmental and social valuations in the Mining Code. Rather, the ISA and states involved in the *Draft Exploitation Regulation* drafting process should put clear, comprehensive and transparent laws, policies and regulations in place, build strong institutions, train skilled professionals and set up accountability mechanisms to implement policy frameworks and rules. For example, On 24 March 2022, Independent Canadian Senator Rosa Galvez introduced the *Climate-Aligned Finance Act*, a piece of legislation to align the activities of federal financial institutions and federally regulated entities with Canada's climate commitments.[409] With sufficient data, ocean valuation enables governments or organizations such as the ISA to monitor changes in ocean wealth, including produced assets (e.g., ports, offshore energy) and non-produced assets (e.g., mangroves, coral reefs), dispersal of ocean-related income among different groups of people (e.g., income from fisheries or tourism for local communities), and the contribution to production from ocean-based economic activities.[410] Choosing which environmental and social valuation techniques to use is not done in isolation. Rather, there are additional sustainable finance frameworks to help guide regulators.

6.4.2 Task Force for Climate-Related Disclosures

The *Taskforce for Climate-Related Financial Disclosures* was established to develop recommendations for more effective climate-related disclosures that could promote informed

[408] Fenichel & Abbott, "Natural Capital", *supra* note 392 at 23.
[409] Senate of Canada, Bill S-243, *An Act to enact the Climate-Aligned Finance Act and to make related amendments to other Acts, 1st* Reading, 24 March 2022, 1st Sess., 44th Parl, 70-71 Eliz., 2021-2022; Senator Rosa Galvez, "Independent Senator Rosa Galvez introduces bill to align Canadian financial sector with climate commitments" (22 March 2022) online: https://rosagalvez.ca/en/media/press-releases/press-releases/cafa-introduction/.
[410] Fenichel, Milligan & Northrop, *supra* note 212.

investment, credit, and insurance underwriting decisions.[411] The Taskforce's final report, released in 2017, advocated for "disclosing clear, comparable and consistent information about the risks and opportunities presented by climate change."[412] Information will "lead to the smarter, more efficient allocation of capital and help smooth the transition to a more sustainable, low-carbon economy."[413] The TFCD established that climate-related financial disclosures should be provided within mainstream annual financial filings for public companies.

Responding to the TFCD report, Canada's Ministers of Environment and Climate Change and Finance appointed the *Expert Panel on Sustainable Finance* to "engage a wide range of stakeholders on opportunities and challenges relating to sustainable finance and climate-related risk disclosures, and to recommend next steps for the Government of Canada to consider in promoting a low carbon, clean economic growth in Canada."[414] In 2019, the Expert Panel released its final report after engaging stakeholders in climate-related risk disclosures.[415] The Expert Panel, led by the new Governor of the Bank of Canada, Tiff Macklem, stated that "outdated perceptions about the materiality of environmental, social and governance issues within the scope of fiduciary duty may hinder responsiveness to risks and opportunities. Sustainable finance is generally not considered a significant return driver or strategic priority."[416] The Expert Panel concluded that data collection, disclosure(s), and enhanced modelling would be necessary to build robust, timely and accessible information on climate risks to reduce and adapt to their impacts.[417] The Expert Panel's fifteen recommendations included suggestions to clarify

[411] TFCD, *supra* note 7.
[412] *Ibid* at i.
[413] *Ibid.*
[414] Expert Panel on Sustainable Finance, *Interim Report of the Expert Panel on Sustainable Finance* (2018) at 1.
[415] Expert Panel on Sustainable Finance, *Final Report of the Expert Panel on Sustainable Finance* (Gatineau, 2019).
[416] *Ibid* at 7.
[417] *Ibid*.

the scope of fiduciary duty in the context of climate change and embed climate-related risk into the monitoring, regulation and supervision of Canada's financial system.[418]

Neither the Expert Panel nor the Taskforce provided details on how they would proceed with their recommendations. What is required is a set of international guidelines for what is acceptable; for instance, in terms of environmental, social and human rights impacts of mineral extraction, getting a fair deal and share of profits, profit repatriation, transparency and accountability, and investing in the future and support of sustainable development objectives.[419] A valuation code incorporating sustainable frameworks and principles would meet these guideline objectives. However, one key outcome of the Taskforce and the Expert Panel is the absolute need for public disclosure of climate-related financial information.

6.4.3 Taskforce on Nature-Related Financial Disclosures

The Taskforce on Nature-Related Financial Disclosures is developing and delivering a risk management and disclosure framework for organizations to report and act on evolving nature-related risks.[420] Currently, financial institutions and companies do not have the information they need to understand how nature impacts the organization's immediate financial performance or the longer-term financial risks that may arise from how the organization, positively or negatively, impacts nature. While the Taskforce on Climate Related Financial Disclosures focused exclusively on climate change, the Taskforce on Nature Related Financial Disclosures has a broader approach, including biodiversity issues.[421] The work (at the dissertation's drafting

[418] *Ibid* at Recommendations 2, 4, 5, 6, 8.
[419] Pedro et al, *supra* note 64 at 163.
[420] TNFD, "Home Page" online: https://tnfd.global/.
[421] TNFD, "Welcome to the TNFD Dashboard" online: https://framework.tnfd.global/dashboard/

date) is incomplete and is currently in 'beta' or draft format, with the final framework expected in September 2023.[422]

The ISA should take notice of the intention to help drive alignment with the emerging global reporting baseline under development by the International Sustainability Standards Board, the Global Reporting Initiative, and best practice standards and tools used by market participants today.[423] Second, it will help provide adaptability and flexibility regarding the approach to materiality to accommodate the preferences and regulatory requirements of report preparers and report users from organizations of all sizes and jurisdictions. Third, it will encourage early action by companies and financial institutions to begin reporting nature-related dependencies, impacts, risks and opportunities, given the urgent need to address nature loss and climate change in an integrated approach. Finally, it will spur investment in valuing nature and biodiversity.[424] Thus, the key takeaways are valuing biodiversity and publicly reporting on biodiversity and other nature related risks and opportunities.

6.4.4 International Sustainability Standards Board

On 3 November 2021, the IFRS Foundation Trustees announced the creation of a new standard-setting board—the International Sustainability Standards Board ("ISSB").[425] The ISSB is intended to deliver a comprehensive global baseline of sustainability-related disclosure

[422] Rainforest Action Network, "The Taskforce for Nature-related Financial Disclosures: Why It's Important to Global Environmental Policy and Why CSOs are Raising Concerns" online: https://www.ran.org/press-releases/the-taskforce-for-nature-related-financial-disclosures-tnfd-why-its-important-to-global-environmental-policy-and-why-csos-are-raising-concerns/?gclid=CjwKCAjwrJ-hBhB7EiwAuyBVXcI6IxHQS-fwI-sQ6fTGySnRI90ahKQX6ifnbTLeTcgGTQYVgoMudxoCpncQAvD_BwE.
[423] TNFD, *Executive Summary to the beta framework*, online: https://framework.tnfd.global/introduction-to-the-framework/executive-summary/v04-beta-release/.
[424] *Ibid*.
[425] The IFRS Foundation is a not-for-profit, public interest organisation established to develop high-quality, understandable, enforceable and globally accepted accounting and sustainability disclosure standards. The Standards are developed by our two standard-setting boards, the International Accounting Standards Board (IASB) and International Sustainability Standards Board (ISSB).

standards. It provides investors and other capital market participants with information about companies' sustainability-related risks and opportunities to help them make informed decisions. The IFRS Foundation will identify the subset of environmental, social and governance issues most relevant to financial performance for seventy-seven (77) industries, including mining, based on the current SASB Standards.[426] Issues pertinent to the mining sector include water use, security, human rights, rights of Indigenous peoples, community relations, business ethics and transparency, greenhouse gas emissions, air quality, energy management, biodiversity impacts, and waste and hazardous materials usage.

In March 2022, the ISSB published Exposure Draft IFRS S1 *General Requirements for Disclosure of Sustainability-related Financial Information* and a separate *Climate-related Disclosure Standard*, proposing overall requirements for an entity to disclose sustainability-related financial information about its sustainability-related risks and opportunities.[427] Disclosure requirements are more robust, with scope 1, 2 and 3 emissions required (as opposed to only scope one under the SASB standard.[428] Moreover, it focuses more on sustainability-linked financial disclosures on an entity's enterprise value. Enterprise value reflects expectations of the amount, timing and uncertainty of future cash flows over the short, medium and long term and the value of those cash flows in the light of the entity's risk profile and its access to finance and cost of capital.[429] It expects entities to report along the value chain and include its employment practices and those of its suppliers, wastage related to the packaging of the products it sells, or events that could disrupt its supply chain, the assets it controls (such as a production

[426] ISSB, "SASB Standards" online: https://www.ifrs.org/issued-standards/sasb-standards/; SASB, *Metals and Mining* (October 2018); SASB, *Metals and Mining Sustainability Accounting Standard* (October 2018).
[427] IFRS, *General Sustainability-related Disclosures* (March, 2022); IFRS, *Climate-Related Disclosures* (March 2022).
[428] *Ibid*.
[429] IFRS, *Exposure Draft, IFRS S1 General Requirements for Disclosure of Sustainability-related Financial Information* (March 2022) at 10.

facility that relies on scarce water resources, investments it controls, including investments in associates and joint ventures (such as financing a greenhouse gas-emitting activity through a joint venture), sources of finance.[430]

The ISSB redeliberated the proposals after considering the feedback on the Exposure Draft and expects to issue an IFRS Sustainability Disclosure Standard around the end of Q2 2023. As such, there is no mining specific policy ready for review. However, the ISA should consider reviewing and incorporating ISSB's general and specific industry standards for contractors and Sponsoring States. The ISSB Standard will agree with the approach taken by the Global Reporting Initiative ("GRI"), which focuses on shareholders and other stakeholders.

6.4.5 GRI Draft Standard Project for Mining

The Global Reporting Initiative ("GRI") supports organizations disclosing information on their business's sustainability impacts, creating a mining and metals supplement guidance in collaboration with the International Council on Mining and Metals ("ICMM") by helping businesses and governments understand and communicate their impact on critical sustainability issues such as climate change, human rights, governance and social well-being.[431] The objective of sustainability reporting using the GRI Standards is to provide transparency on how an organization contributes or aims to contribute to sustainable development.[432] The GRI is regarded as the most comprehensive guide to developing sustainability reports. [433]

A sustainability risk means an environmental, social or governance event or condition that, if it occurs, could cause a negative material impact on the value of the investment, as

[430] *Ibid* at 13.
[431] GRI, *Consolidated Set of GRI Sustainability Reporting Standards 2016* (19 October 2016).
[432] GSSB, GRI *Sector Standards Project for Mining*, Mining Working Group Terms of Reference (August 2021).
[433] David Talbot & Olivier Boiral, "GHG Reporting and Impression Management: An Assessment of Sustainability Reports from the Energy Sector" (2018) 147 J Business Ethics 367.

specified in sectoral legislation.[434] The GRI's current iteration focuses on the materiality of information, contextual disclosures about an organization, and the proper management approach to report how a company manages its material topics. The GRI defines Material Aspects as those that reflect the organization's significant economic, environmental, and social impacts or substantively influence stakeholders' assessments and decisions.[435] The resulting reporting framework provides sector-specific indicators for economic, environmental and social purposes that are "encountered more frequently or in greater measure than in other sectors" and that should be considered over the entire mine lifecycle.[436]

In February 2019, the Global Sustainability Standards Board ("GSSB") approved the GRI Sector Program to improve clarity and consistency in sustainability reporting, including an increased emphasis on extractives.[437] The primary objective of developing the new standard is to improve the transparency of the impacts across the mining sector.[438] The key criterion for prioritizing sectors is their sustainability impacts. This considers the significance of the sector's impacts, considering their scale, scope, character and likelihood. It also considers the sector's size, distribution worldwide and the number of organizations from that sector that can use the GRI Standards. Based on these criteria, mining has been selected as the first Sector Standard developed after the pilot projects.

The danger here is that the approach used by the GRI can be perceived as lacking a focus on investors' concerns. As such, the new mining sector standard will identify and describe the topics that are likely material for a reporting organization in the mining sector based on the

[434] PwC, *Business Reporting on the SDGs, Analysis of the Goals and Targets* (GRI, 2018) at 2, 11, 198.
[435] *Ibid* at 6.
[436] Verrier et al, *supra* note 403.
[437] GRI, *GRI Sector Standards Project for Mining*, (approved by the GSSB 17 June 2021).
[438] GRI, "*GRI Sector Standards Project for Mining – FAQs"* online: https://www.globalreporting.org/media/f4bkhjbh/gri-sector-standard-project-for-mining_faqs-1.pdf.

sector's most significant impacts and will provide evidence and authoritative references for these topics to assist organizations in identifying if they are material for them. The mining sector standard identifies twenty-five (25) topics that encapsulate the full range of impacts for mining organizations, including reporting GHG and air emissions, biodiversity impacts, closure and rehabilitation plans and activities, engagement with Indigenous peoples, artisanal and small-scale mining, and child and forced labour, biodiversity, water and waste, community engagement and human rights, including those of Indigenous Peoples, land and resource rights, modern slavery and forced labour, anti-corruption, procurement, and payments to governments.[439]

The GRI Standards enable public reporting of an organization's most significant impacts on the economy, environment, and people. This perspective differs from the one that will be taken in ISSB, which is based on sustainability-related risks and opportunities most likely to affect a company's financial condition, operating performance or risk profile. GRI and ISSB (including SASB Standards) are complementary because of their materiality approaches and can be viewed as two interconnected reporting pillars that address distinct perspectives and different audience needs. Because of these different perspectives, the topics and disclosures included in the respective Standards may differ. For example, the GRI Mining exposure draft includes topics such as closure and rehabilitation, forced labour and modern slavery, conflict over resources and land, or public policy, which the SASB Standards do not address. However, there is likely to be some correlation between material topics and metrics across the two sets of Standards, such as biodiversity, GHG emissions, air quality, or labour relations.[440]

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[439] GRI, "Unearthing the Truth About Mining Impacts" (February 2023) online: https://www.globalreporting.org/news/news-center/unearthing-the-truth-about-mining-impacts/?utm_campaign=13805199_Newsletter-February-2023&utm_medium=Engagement%20Cloud&utm_source=Global%20Reporting%20Initiative&dm_i=4J5,87W5R,R8UEPH,XQ12I,1.

[440] GRI, *Mining FAQs, supra* note 438.

As neither the ISSB nor the GRI standards are final, it is impossible to give concrete recommendations on which framework should be used as a basis for a seabed mining valuation code. However, once the standards have been finalized, follow-up research should be conducted to determine how they can be incorporated into a valuation code.

6.4.6 Equator Principles

The Equator Principles ("EPs") are used to determine, assess and manage environmental and social risks in mining projects, ensure a minimum standard for due diligence and monitoring, and have direct financial implications for financial institutions investing or financing large mining projects.[441] The EPs apply to all project financings with capital costs above $10 million. The Approach to applying the Principles to countries with existing standards for environmental and social issues has been streamlined. Reporting on progress and performance is a more important part of the latest iteration of the Principles, as are stronger and better social and environmental standards, including more robust public consultation standards.[442]

The Equator Principles are highly relevant to mining projects.[443] The revised principles employ an outcomes-based approach with clear requirements for client performance and project outcomes.[444] The standards include established issues such as biodiversity conservation and involuntary resettlement while covering new areas such as employee working conditions, community security and health, alongside greater consultation, transparency and

[441] Equator Principles, "Equator Principles" online: https://equator-principles.com/about-the-equator-principles/ (accessed 15 June 2022). As a note to the reader, the EPs are created and written by the financial industry, and is thus their 'take' on environmental and social risk.
[442] International Mining Inc., "Revised Equator Principles" online: https://im-mining.com/2006/08/29/revised-equator-principles/ (accessed 14 June 2022).
[443] Ruth Aguilera & Cynthia Williams, "Law and finance: inaccurate, incomplete, and important. (Evaluating Legal Origins Theory Symposium)" (2009) 6 BYULR 1413.
[444] Christine Shulse et al, "Polymetallic nodules, sediments, and deep waters in the equatorial North Pacific exhibit highly diverse and distinct bacterial, archaeal, and microeukaryotic communities" (2017) 6:2 MicrobiologyOpen e00428; John Conley & Cynthia Williams, "Global Banks as Global Sustainability Regulators? The Equator Principles" (2011) 33:4 Law and Policy 542.

accountability.[445] The EPs have more precise categorization requirements. Categorization determines the level of due diligence required. Category A projects have significant adverse environmental and social impact risks that are diverse, irreversible or unprecedented.[446] Should a project be too risky, then under the EPs, the project should not be funded.[447]

The Principles incorporate the *United Nations Guiding Principles on Business and Human Rights* and add reporting requirements for project sponsors related to biodiversity and greenhouse gas emissions like the standards in the Recommendations from the *Task Force on Climate-related Financial Disclosures*.[448] They may require additional diligence, reporting, and other obligations on future projects for mining companies and financial institutions.

The member financial institutions that have signed the Equator Principles have agreed that for a company to receive investment finance, it must meet eight Environmental and Social Performance Standards developed by the International Finance Corporation. [449] The Performance Standards guide identifying risks and impacts and are designed to help avoid, mitigate, and manage risks and impacts to do business sustainably.[450] The eight standards include assessing and managing environmental and social risks and impacts, labour and working conditions, resource efficiency and pollution prevention, community health, land acquisition and involuntary resettlement, biodiversity conservation and sustainable management of Indigenous Peoples, and cultural heritage.

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[445] Gillian Davidson, "Beyond the Mine Mouth: The Equator Principles and IFC Performance Standards" (1 April 2008) online: https://www.mining.com/beyond-the-mine-mouth-the-equator-principles-and-ifc-performance-standards/ (accessed 14 June 2022).
[446] Mark Norris, *The Equator Principles — A Refresher and an Update* (Sullivan & Worcester LLP, 2017) at 10.
[447] SDG Plus, "What are the ten statements of the Equator Principles?" online https://www.sdgplus.org/2022/05/03/what-are-the-equator-principles/.
[448] Alison Babbitt & Michael Cockburn, "The new Equator Principles: the implications for Canadian mining" (2020) 141:6 Canadian Mining Journal 6–6.
[449] IFC, *Performance Standards on Environmental and Social Sustainability* (1 January 2012).
[450] Daniel OB Jones et al, "Existing environmental management approaches relevant to deep-sea mining" (2019) 103 Marine Policy 172–181.

Performance Standard 1 establishes the importance of integrated assessment to identify the environmental and social impacts, risks, and opportunities of projects; effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them and the client's management of environmental and social performance throughout the life of the project.[451] The requirements are set out in Performance Standard 6. The interpretation of those requirements provided in this Guidance Note is guided by the CBD, including its Strategic Plan for Biodiversity 2011–2020 and the Aichi Biodiversity Targets.[452]

The Equator Principles have always been aligned with the IFC Performance Standards and have made compliance with those standards mandatory for projects in all Non-Designated Countries.[453] However, for Designated Countries, which consist of high-income countries around the world, the comparatively robust environmental, social and regulatory laws and protections present in those countries are considered to provide sufficient risk management and sustainability standards such that compliance with domestic jurisdiction laws in Designated Countries was considered sufficient to be aligned with the Equator Principles. Compliance with domestic laws is still required for projects in Designated Countries.[454] However, at the same time, EP4 moves beyond the clear distinction that existed between Designated and Non-Designated Countries under the previous versions of the Equator Principles. The new EPs now make projects in Designated Countries equally subject to evaluation against IFC Performance

[451] IFC, Performance Standards, *supra* note 442; IFC, International Finance Corporation's Guidance Notes: *Performance Standards on Environmental and Social Sustainability* (1 January 2012).
[452] IFC, *Guidance, supra note 444 at Note 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources* (updated June 27, 2019), IFC, *Performance Standard 6 Biodiversity Conservation and Sustainable Management of Living Natural Resources* (1 January 2012).
[453] Aguilera & Williams, *supra* note 443.
[454] Equator Principles, *supra* note 441.

Standards, where the specific risks associated with the project warrant it.[455] When host country regulations differ from the levels and measures presented in the EHS Guidelines, projects are expected to achieve whichever is more stringent.[456]

6.5 Code for Environmental Management of Marine Mining

The International Marine Minerals Society is a professional society whose members share a common interest in marine minerals as a resource for study and sound application to meet world demands for strategic minerals. Founded in 1987, IMMS includes a worldwide membership of individuals from industry, government agencies, and academic institutions.[457] The International Marine Minerals Society approved the development of this Code at its Annual General Meeting in January 2000, following a proposal made at the 2000 Underwater Mining Institute by Julian Malnic, founder and first Chief Executive Officer of Nautilus Minerals Corporation.[458] The Code for Environmental Management of Marine Mining consists of a statement of Environmental Principles for marine mining, followed by a set of guidelines for application as appropriate at specific mining sites. The guidelines are designed to serve the industry, regulatory agencies, scientists and other stakeholders as benchmarks for developing, implementing and assessing environmental management plans and practices at sites targeted for marine minerals research, exploration and extraction.[459] It also provides a framework and benchmarks for local communities and other stakeholders, governments, and intergovernmental and non-governmental organizations to assess proposed and actual applications of environmental practices at marine

[455] Norton Rose, "Equator principles 4 enter into force: What will this mean in practice?" (September 2020) online: https://www.nortonrosefulbright.com/en/knowledge/publications/3a6e7a7b/equator-principles-4-enter-into-force-what-will-this-mean-in-practice (assessed 14 June 2022).
[456] IFC, *Guidance Note 1 Assessment and Management of Environmental and Social Risks and Impacts* (updated 14 June 2021).
[457] International Marine Minerals Society, "Home" online: https://www.immsoc.org/.
[458] *Ibid*.
[459] International Marine Minerals Society, *Environmental Management Code* (16 September 2011).

mining sites.[460] As well as complying with any applicable national and international requirements, companies or entities adopting the Code commit themselves to provide transparency in their environmental activities by regularly reporting environmental planning, monitoring, assessment and other actions relating to protecting and preserving the marine environment. These reports will demonstrate the company or entity's commitment to and implementation of the Code, describe the company/entity's performance concerning the Principles and Operating Guidelines, and be made public.[461]

Marine mining companies/entities adopting this Environmental Code commit themselves to observe the laws and policies of sovereign nations and their regional sub-divisions and international law, to apply best environmental and resource protection procedures, to observe the precautionary approach, from initiating a project through all stages, from exploration through development and operations, including waste disposal, to eventual closure and post-closure monitoring, to consult with stakeholders and facilitate community partnerships and to report publicly on environmental performance and implementation of the Code.[462]

A goal of the code is to improve knowledge of the properties, short- and long-term availability and use of marine mineral resources and their related ecological and environmental effects, including the development and use of methods to quantify and integrate the valuation, preservation of value and enhancement of the value of ecosystem services adjacent and related to the resource to be developed. Another aim of the Code is to consider the biological resource potential and value of living organisms at potential marine mining sites and the mineral resource

[460] *Ibid* at 2
[461] *Ibid*.
[462] *Ibid* at 4.

potential and value.[463] The code recommends integrating environmental and social factors into a valuation code. This code does not recommend how this could be accomplished.

6.5.1 A Seabed Mining ESG Handbook for Marine Minerals?

On 14 February 2023, a consortium of organizations, including several seabed mining contractors, announced the plans for a seabed mining ESG handbook.[464] The handbook will build upon reporting standards such as GRI and Towards Sustainable Mining. The handbook seeks to become a useful disclosure guidance tool for companies, enabling internal and external stakeholders to access this data in a consistent format. The handbook will not drive any legal framework and is not intended to be a compliance tool.[465] However, as of the date of writing, this tool has not been drafted.

6.6 Conclusion

The extractive sector's development benefits are impeded by incomplete accounting of sector impacts on wealth, which in comprehensive terms includes infrastructure and financial capital, institutions and communities, and natural capital, including biotic and abiotic components of the environment. Key principles learned include transparent decision-making, public participation, valuing environment and social factors, public reporting requirements, and a robust legal and regulatory system to ensure that the Common Heritage of Mankind meets sustainable development. Improved management of an asset should raise the asset's value.[466] A valuation framework is needed to enable all actors to assess the compatibility of their decision-making

[463] *Ibid* at 5; PA Verlaan, "The International Marine Minerals Society's Code for Environmental Management of Marine Mining." (2011) 11 Oceans 1 Web.
[464] MarketScreener.com, "Developing the first ESG handbook for marine minerals" (14 February 2023) online: https://www.marketscreener.com/quote/stock/TMC-THE-METALS-CO-A-126939189/news/Developing-the-first-ESG-handbook-for-marine-minerals-42982604/; Yahoo Finance, "Developing the first ESG handbook for marine minerals" (14 February 2023) online: https://ca.finance.yahoo.com/news/developing-first-esg-handbook-marine-121500978.html.
[465] *Ibid*.
[466] Fenichel & Hashida, *supra* note 175.

with sustainable development and overcome the lack of coordination and integration of existing normative environmental, social and financial frameworks.[467]

No current sustainable mining framework directly ties to valuing an asset. Current market prices may provide misleading signals about the benefits of mining.[468] Policy action by the ISA is needed to set global standards in the form of rules and regulations, mining standards, and reporting obligations that include disclosing information. What is required is a set of international guidelines for what is acceptable, for instance, in terms of environmental, social and human rights impacts of mineral extraction. Possible instruments include environmental standards, economic and market-based instruments such as fiscal instruments (e.g., taxes, charges, subsidies), financial instruments, liability instruments, and performance bonds. Self-regulating or meta-regulatory instruments can include standards and codes of practice, corporate environmental reporting, product verification and labelling, and award schemes.

[467] IISD, "IRP Report Proposes Governance Framework for Extractives" (27 February 2020) online: https://sdg.iisd.org/news/irp-report-proposes-governance-framework-for-extractives/.
[468] Fenichel & Abbott, "Natural Capital", *supra* note 385 at 9.

Chapter 7 – A Framework Sustainable Seabed Mining Valuation Code

> Noting that the open-ended working group of the Council, created in July 2018 to discuss a financial model and payment mechanism in its Fourth Session, suggested that a study be carried out on environmental costs, including how to internalize the costs associated with environmental externalities, these in turn including the valuation of ecosystem services and natural capital, as well as incentives for contractors to continuously improve their environmental protection practices and options on how these can be reflected in the payment system.[1]

Chapter 7 explores whether it is possible to use seabed mining finance (through the development of a comprehensive seabed mining valuation code) to effectively minimize environmental and human rights harms and recommends methods to improve seabed mining finance. These recommendations will incorporate frameworks such as the IGF Mining Policy and the TSM Protocols into ten (10) 'principles' that must be addressed in such a code. These principles include the necessity of valuing equitable sharing and the Common Heritage of Mankind, valuing seabed minerals accurately, valuing nature and equality, publicly disclosing valuations, standardizing valuations and integrating these valuations into all financial arrangements. Finally, the chapter will propose a table of contents for such a sustainable seabed mining valuation code.

Chapter 7 shows that determining a fair value for polymetallic nodules is challenging. There are no current transactions or existing operations from which to estimate costs, precedents for the allocation of price risk between collector and processor, or direct analogues in land-based mining and processing because there is no asset valuation code for seabed mining. A valuation code would potentially assist in this valuation. After nodule collection and processing facilities begin operating, reported transaction prices may not represent the nodule value as the environmental and social impacts have not been properly estimated.[2]

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[1] *Draft decision of the Council of the International Seabed Authority related to the commissioning by the Secretariat of two studies on the internalization of environmental costs of exploitation activities in the Area into the production costs of minerals from the Area ISA DOC.* ISBA/27/C/CRP.2/Rev.1 (27 July 2022).

[2] CRU Consulting, *Polymetallic nodule valuation A report for the International Seabed Authority*, CRU Reference: C-07177 (2020) at 2.

7.0 A Seabed Mining Valuation Code

In 2022, the ISA representatives from Costa Rica and Germany made a joint recommendation to the ISA to commission an independent study to assess the value of ecosystem services and natural capital of the Area.[3] This recommendation requested the inclusion of the potential environmental costs of potential activities in the Area, including the incorporation of estimates of monetary values of effects on ecological functions and ecosystem services. Costa Rica and Germany requested that the study include a current valuation of the deep sea and its related ecosystem services and natural capital and cover direct and indirect environmental impacts that will occur on the seafloor, the sub-soil thereof, and the water column. The study should include a proposed methodology for an economic valuation of the environmental costs of a particular mining concession so that applicants can apply such a methodology for exploitation contracts and the results delivered as part of their plan.[4] This recommendation was adopted in late 2022, and the ISA has called for a proposal to be completed in June 2023.[5] As such, this dissertation can help serve the ISA in integrating internalizing environmental costs, including equitable resource sharing. The valuation code's table of contents shows where and how such costs can be embedded in financial valuations.

[3] Joint proposal submitted by Costa Rica and Germany, *supra note 1*.
[4] *Ibid* at 2.
[5] ISA, *Draft decision of the Council of the International Seabed Authority relating to the development of binding environmental threshold values Submitted by the delegation of Germany* ISBA/27/C/L.4 (27 September 2022).

7.1 Goals of a Seabed Mining Valuation Code

> Terrestrial mining can provide no more than limited guidance, as the technologies and operations required for deep-sea excavation differ from land-based operations.[6]

Different revenue-raising instruments allocate risks differently among contractors, the ISA, and States. A potential trade-off exists between creating incentives and the appropriate allocation of risk.[7] As risk raises costs, the payment regime should consider the risk to contractors, States, and the ISA and seek to create a stable and predictable environment, including a stable payment regime.[8] What is required is a set of generally accepted international guidelines for what is acceptable, for instance, in terms of environmental, social and human rights impacts of mineral extraction, getting a fair deal and share of profits, profit repatriation, transparency and accountability and investing in the future and support of sustainable development objectives. The guidelines must set clear and concrete benchmarks for countries and companies.[9]

This section will outline the author's ten principles, supported by research and proposed by this dissertation, for creating a Sustainable Seabed Mining Valuation Code. The framework principles are drawn from land-based mining valuation codes, the work of the ISA on mineral evaluation, and the gap analysis provided earlier in the dissertation. The principles are:

1. Valuing equitable sharing and the Common Heritage of Mankind,
2. Valuing minerals found on the seafloor and cash flow accurately,
3. Valuing nature and biodiversity,
4. Valuing equality,
5. Making all valuations public,
6. Standardizing valuations to avoid regulatory capture,
7. Integrating all funds and guarantees into a code,
8. Creating data requirements,
9. Allowing regional approaches, and

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[6] Luc Cuyvers et al *Deep seabed mining A rising environmental challenge* (IUCN: Gallifrey Foundation, 2018) at 51.
[7] Brigitte Haar, "Freedom of contract and financial stability through the lens of the Legal Theory of Finance (LTF): LTF approaches to ABS, Pari Passu-Clauses, CCPs, and Basel III" (2016) 141.
[8] *Ibid*.
[9] Antonio Pedro et al, "Towards a sustainable development licence to operate for the extractive sector" (2017) 30:2 Miner Econ 153 at 163.

10. Creating a valuation code that does not artificially disadvantage terrestrial mining operations.

The final principle will require substantial updates to terrestrial mining codes so that they also value nature, biodiversity, equality and transparency.

1. Value equitable sharing and the Common Heritage of Mankind (Principle of Equity)

Seabed mining activities must consider the interests of developing States and the environment.[10] Developing States shall be further protected from adverse effects on their economies or export earnings resulting from a reduction in the price of an affected mineral or in the volume of exports of that mineral to the extent that such reduction is caused by activities in the Area.[11] Equitable sharing arises with equitable utilization of seabed mineral resources while balancing all interests and considerations at stake.[12]

Mining interests may clash with common heritage ideals. The current ambiguities in financial definitions discussed in Chapter 6 provide uncertainty when creating a fiscal framework, putting the ISA in a delicate position.[13] On the one hand, a goal of mining is to ensure an optimum benefit to the ISA. This optimum revenue may be contrary to the Common Heritage of Mankind and intergenerational equity.[14] As such, valuing minerals, environmental protection, and setting a royalty rate for equitable sharing are interdependent and cannot be fully assessed independently. The most appropriate approach for determining a royalty must be

[10] *United Nations Convention on the Law of the Sea* 1833 UN Treaty Series 397, 1982 at Article 136; Jaeckel, Aline, Jeff A Ardron & Kristina M Gjerde, "Sharing benefits of the common heritage of mankind – Is the deep seabed mining regime ready?" (2016) 70:C Marine Policy 198; The Pew Charitable Trusts and RESOLVE, Inc, 2018 - Common Heritage of Mankind: Definition & Implementation - Final Report v2 (Ocho Rios, Jamaica, 2018) at 5.
[11] *UNCLOS*, *supra* note 10 at Articles 1(3), 150(h).
[12] Marie Bourrel, Torsten Thiele & Duncan Currie, "The Common Heritage of Mankind as a Means to Assess and advance equity in deep sea mining" (2018) 95:C Marine Policy 311 at 313.
[13] Bourrel, Thiele & Currie, *supra* note 12; Goldie, LFE, "A note on some diverse meanings of 'the common heritage of mankind.'" (1983) 10:1 Syracuse Journal of international law and Commerce 69 at 70, 71, 79; Feichtner, Isabel, "Contractor liability for environmental damage resulting from deep seabed mining activities in the area" (2020) 114 Marine policy 103502.
[14] As shown in the Nauru push for the two-year rule. See Chapters 3 and 6, *supra*.

transparent, easily monitored, provide an appropriate return, and meet other administrative and return parameters. It should also reflect the proportion of value added at the processing stage to avoid unduly burdening the nodule collector.

Optimum revenue may not be implementable due to the diverse types of mining operations and the different technologies used. In addition to scientific uncertainty, the most frequently articulated conditions or circumstances are concerns of an intergenerational nature and forensic or proof difficulties, generally in the context of rapid change and perceived high risks. According to Anton and Kim:

> Seabed miners may need to take greater risk by accepting a scaled or staged implementation, but this may render seabed mining commercially unviable. Seabed miners will need to offer a fair share of economic benefits to the people and the country. Economic benefits through taxes and royalties alone were deemed insignificant in this case, especially in the face of large uncertainties in terms of adverse economic effects on existing interests, such as fisheries.[15]

A royalty system will include a payment mechanism, a contractual system of financial plans and liabilities, a method of revenue collection, and a means of benefit sharing and distribution.[16] The ISA collects royalties and will distribute payments to developing nations based on the principles of the Common Heritage of Mankind.[17] The *Exploration Regulations* do not provide for royalty payments and profit-sharing mechanisms but leave it to the *Draft Exploitation Regulations* and any Standards and Guidelines created by the ISA.[18] Annex III, Article 13 of UNCLOS identifies the guiding objectives for financial terms of contracts.[19] Goals include prioritizing commercial production, attracting investments and technology, ensuring

[15] Anton, Donald & Rakhyun Kim, "The application of the Precautionary and Adaptive Management Approaches in the Seabed Mining context: Trans-Tasman Resources Ltd. marine consent decision under New Zealand's Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012" (2015) 30:1 Int J Marine Coastal L 175.
[16] *Draft Regulations on Exploitation of Mineral Resources in the Area* (2019), ISBA/25/C/WP1 at Regulation 64.
[17] *Ibid* at Part VII, ss. 2, 3; *UNCLOS, supra* at note 10 at Article 140(2).
[18] *UNCLOS*, *supra* note 10 at Annex III, Article 13(3); *Agreement relating to the implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982*, 1836, UNTS 42 1994 at Annex, s. 8(2), 8(1)(d).
[19] *UNCLOS*, *supra* note 10 at Annex III, Article 13.

equality of financial treatment and comparable financial obligations for contractors, and ensuring that, because of the financial incentives provided to contractors, contractors are not subsidized to be given an artificial competitive advantage concerning land-based miners.[20] Article 171 is designed to ensure optimum revenues for the ISA.[21] The funds that remain after payment of administrative expenses may be shared to provide the Enterprise with funds or compensate developing States.[22]

A seabed mining valuation code can be developed by combining the SDGs, the Towards Sustainable Mining, the Responsible Minerals Initiative, and the Intergovernmental Forum on Mining, Minerals and Sustainable Development with mining valuation codes. As first illustrated in Chapter 4, the IGF Mining Policy Framework asserts that terrestrial mining codes and standards should be revised and updated to reflect changing knowledge and best practice. They should deal with all aspects of mining, from exploration to closure and post-closure management. The data and reporting requirements by entities should be explicit in exploration and operating licences so that authorities can make informed decisions.[23]

Such codes, accounting standards and taxation/royalty regimes will be transparent and as stable as is consistent with the responsibility for keeping them up to date and relevant to the economic and development requirements of the country. For example, an appropriate metric for measuring the burden of such a royalty should be a percentage of the full collector costs (i.e., operating costs plus return on capital). An appropriate social discount rate would be used to calculate the present value of future contractual/royalty payments from qualified, eligible

[20] *Ibid*.
[21] *Ibid* at Article 171.
[22] *Ibid* at Article 173.
[23] IGF, *IGF Mining Policy Framework, Mining and Sustainable Development* (October 2013) at 8.

contractors, representing a measure of the resource wealth associated with the Common Heritage of Mankind managed by the ISA.[24]

Incentives should be time-bound, performance-linked, transparent, balanced and measured against their costs and effective representation by all interested parties, sometimes requiring capacity building for some stakeholders, a participant-driven agenda, well-defined rules of the process, taking time to create trust among stakeholders; and an early focus on finding "low-hanging fruit" - practical, scalable solutions. The valuation code will help implement a revenue generation scheme that optimizes the return from the mining activity and the taxation agreements achieved, maximizes resource levy revenues to society during times of high prices while minimizing the need for entities to reduce or end production during times of low prices and supporting a variety of sustainable development objectives; and seeks to integrate the mineral sector with other sectors of the economy to optimize the contributions of the mineral sector.

A mineral asset valuation code maintains sufficient flexibility to ensure that a balance is achieved between optimizing revenue from mining activities while permitting the mine developers and operators a positive rate of return on their investment. Additionally, it would allow States to use national corporate income taxes based on net profits as the common element for large- and small-scale commercial mining and taxes in the same manner as non-mining entities within a jurisdiction but with the potential for allowances specific to mining for defined expenditures and accelerated deductions to achieve specific public policy aims. It addresses the distribution of benefits by providing open and transparent data on tax and royalty flows and how the benefits have been distributed at the local, regional and national levels.

[24] Mark Freeman, Ben Groom & Zachary Turk, *A Study to Determine the Appropriate Social Discount Rate for the International Seabed Authority* (University of York: ISA, 2020).

As discussed in Chapter 2, five essential elements of the Common Heritage of Mankind include the non-appropriation of resources, common management, benefit-sharing, peaceful use, and preservation for future generations.[25] Benefits sharing includes social well-being and intergenerational equity.[26] Social well-being can be calibrated by using the information on how society, or the ISA, measures well-being and how much weight to put on future well-being. These weights include a "time" effect coupled with a wealth effect. This wealth effect estimates the future state. As discussed, intra-temporal fairness and social welfare increase by transferring wealth from richer to poorer generations.

Nevertheless, the social welfare function discussed in the previous chapter is not incorporated into any financial model. It is seen as an independent variable. Maximizing the productive life of a mine could maximize employment opportunities, promote further exploration and development of similar mineral resources, promote expenditures in social and economic development programs, and generate financial support for the remediation or management of orphaned or abandoned mines.[27] A competent sustainable seabed mining valuation code would necessarily incorporate all material information. VALMIN defines competence as competence in geosciences, engineering, metallurgy, environmental assessment, geopolitics, finance, tax, law, tenure, valuation, commerce, and the Modifying Factors that may all be required.[28] Contractors are not required to include basic social information in financial calculations. Nor

[25] *UNCLOS*, *supra* note 10 at Articles 137, 139, 141, 192, 235; Erik van Doorn, "Environmental Aspects of the Mining Code: Preserving Humankind's common heritage while opening Pardo's box?" (2016) 70 Marine Policy 192–197; Tullio Scovazzi, "The concept of Common Heritage of Mankind and the genetic resources of the seabed beyond the limits of national jurisdiction" (2007) 14:25 Agenda internacional (Lima, Peru) 11–24; Goldie, *supra* note 13.
[26] WK van den Burg Sander et al, "Mobilizing investors for blue growth" (2017) 3:Jan Frontiers in Marine Science 2296–7745.
[27] Freeman, Groom & Turk, *supra* note 24 at 28.
[28] Australian Institute of Geoscientists, *Australasian Code for Public Reporting of Technical Assessments of Mineral Assets (the VALMIN Code) 2015 Edition* (AusIMM, 2015) at 11.

are they including information such as environmental costs and equitable sharing of resources in their calculations. Integrating and incorporating social welfare into a royalty and financial calculation would be a primary requirement in a seabed valuation code.

2. Value Seabed Minerals and Cash flows Accurately (Principle of Competence)

> The gross value of the nodule is estimated to be $484/tonne, which would be equivalent to the gross metal content value of a theoretical 8% copper ore. As most run of mine copper grades are around or even below 1% Cu, it is clear that the in-situ value of the nodules is comparatively very high.[29]
>
> The gross metal content value of the nodules does not represent their fair value.[30]

Principle 2 of a seabed mining valuation code will, by definition, value minerals in a standardized way. A terrestrial valuation report expresses an opinion on the monetary value of a Mineral Asset but specifically excludes commentary on the value of any related corporate Securities.[31] A valuation can refer to the estimated value or the act of valuing. Valuation is distinct from evaluation, which may be used in a valuation or as a basis for a valuation but is not a valuation per se. Evaluation means assessing a Mineral Property's physical, technical, legal, economic, or other aspects, which may be used to make an investment decision. Evaluations include Feasibility Studies, Prefeasibility Studies, Preliminary Economic Assessments, and Scoping Studies.[32] As per Chapter 5, the ISA uses CRIRSCO for evaluation but does not have a code for valuation. This is problematic as Mineral Property valuations are carried out for a variety of reasons, including support for fairness opinions, mergers and acquisitions, non-arm's length transactions, pricing securities in initial public offerings, listing support, support for

[29] CRU Consulting, *supra* note 2 at 2.
[30] *Ibid* at 3.
[31] VALMIN, *supra* note 28 at 18.
[32] *The CIMVAL Code for the Valuation of Mineral Properties* (Canadian Institute of Mining, Metallurgy and Petroleum on the Valuation of Mineral Properties 2019) at 2.

financial statements, support for property agreements, royalty payments, litigation, expropriation compensation, income tax matters, insurance claims, and corporate valuations.[33]

As the section's introductory quote shows and discussed in Chapters 4 and 5, precise valuation has not been done with seabed minerals as they value gross *in situ* values of the wet (now dry) minerals. The lack of a royalty regime and valuation code makes cash flow projections inaccurate.[34] As JORC declares:

> The publication of *in situ* or 'in ground' financial valuations breaches the principles of the Code as the use of these terms is not transparent and lacks material information. It is also contrary to the intent of Clause 28 of the Code. Such *in situ* or in-ground financial valuations must not be reported by companies concerning Exploration Results, Mineral Resources, or deposit size. Using such financial valuations (usually quoted in dollars) has little or no relationship to economic viability, value or potential returns to investors. These financial valuations can imply economic viability without the apparent consideration of the application of the Modifying Factors, in particular, the mining, processing, metallurgical, infrastructure, economic, marketing, legal, environmental, social, and governmental factors.[35]

APPROACH	DESCRIPTION	METHOD	EXPLORATION ASSETS	DEVELOPMENT ASSETS	PRODUCTION ASSETS
Income / Cash Flow	Relies on the "value-inuse" principle and requires determination of the present value of future cash flows over the useful life of the Mineral Property.	Discounted Cash Flow	Not generally used	Widely used	Widely used
		Real Options	Less widely used	Quite widely used	Quite widely used
		Monte Carlo Analysis	Less widely used	Less widely used	Less widely used
		Probabilistic Methods	Not widely used	Not widely used	Not widely used
Market	Relies on the principle of substitution. The Mineral Property being valued is compared with the transaction value of similar Mineral Properties, transacted on an open market.	Comparable Transactions	Widely used	Widely used	Widely used
		Option Agreement Terms	Widely used	Widely used	Quite widely used
		Gross "in Situ"Metal Value	Not acceptable		
		Net Metal Value per unit of metal	Widely used rule of thumb.		
		Value per Unit Area	Widely used	Not widely used	Not widely used
		Market capitalization	More applicable to single property asset junior companies.		
Cost	Relies on historical and/or future amounts spent on the Mineral Asset.	Appraised Value	Quite widely used	Not widely used	Not widely used
		Multiples	Quite widely used	Quite widely used	Widely used
		Geoscience Factor	Not widely used	Not widely used	Not widely used

[36]

Table 2: Summary Table of Valuation Approaches

A seabed mining valuation code would assist the ISA in conforming with international best practices. Reporting Exploration Results, Mineral Resources or Ore Reserves for polymetallic deposits in terms of metal equivalents (a single equivalent grade of one major

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[33] *Ibid*.
[34] Sebastian Volkmann, *Blue Mining—Planning the Mining of Seafloor Manganese Nodules* (Ph.D. Thesis, RWTH Aachen University, 2018) [unpublished] at 60.
[35] *Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves*, by The Joint Ore Reserves Committee of The Australasian Institute of Mining (Australian Institute of Geoscientists and Minerals Council of Australia, 2012) at 24–25; *CIMVAL*, *supra* note 32 at 17.
[36] CSA Global, "Introduction to valuation for mineral projects. Part I: Methods for valuating early-stage project" (17 February 2019) online: https://www.csaglobal.com/valuation-for-mineral-projects-part-1/ (accessed 10 November 2022).

metal) must show details of all material factors contributing to the net value derived from each constituent. A sustainable seabed mining valuation code would also have a framework to derive the valuation method's applicability depending on the subject property's development stage. Exploration properties are suited to the market or cost approach; the income approach is not applicable due to a lack of data. Mineral resource properties are suited to the market and income approaches. Development and Production properties are only suited to market and income approaches. The cost approach is not suitable.

A sustainable seabed mining code would also necessitate a Feasibility Study, a Preliminary Feasibility Study or, subject to applying a higher discount rate, a Preliminary Economic Assessment. Data that must be included in these studies:

- The tonnage and grade of the mineral reserves or, where appropriate, mineral resources,
- The annual rate of production can be sustained from those resources, concerning the available market for the commodity to be produced,
- The annual cash revenue accruing from the production and sale of mineral commodities,
- The annual cash cost of producing those saleable mineral commodities,
- The annual level of cash income taxes and other taxes to be levied on the profits or, in certain instances, on production or sales,
- The levels of cash capital expenditure required to construct the mine and associated facilities and, subsequently, to replace obsolete or worn-out equipment,
- Selection of the appropriate discount rate to be applied in determining the present value of estimated future cash flows regarding the risks inherent in achieving such cash flows.[37]

The disclosure of Mineral Property Valuations is subject to applicable securities laws. A report that deals with proposed mining and processing must include a description of mining or recovery methods with the relevant forecast and realized mining or recovery statistics, a description of the plant, technology and operating practices, together with actual or forecast process plant recoveries from mill feed to marketable products and if relevant, reasons to support any recommendation to reopen facilities that are either on care and maintenance or have been

[37] Jane Spooner, "Mineral Property Valuation: Principles and Procedures 101" (2 March 2018) online: https://www.micon-international.com/mineral-property-valuation-principles-procedures-101/ (accessed 21 November 2022).

abandoned.[38] Certain metals, such as gold, copper, lead, zinc or nickel, can generally be assumed to be saleable since there are established markets of last resort, and only the price has to be determined. With other commodities, the ability to sell the output from a new mine is far less certain unless a firm sales contract is already in place. In these cases, the appropriate production rate cannot be selected without reference to the available demand and should be supported by a detailed market study. Ideally, a thorough, well-reasoned forecast of future supply, demand and price is integral to any valuation. TMC once again states:

> There are no Mineral Reserve estimates for the NORI Property. The potential viability of the Mineral Resources has not yet been supported by detailed mine design or optimization processes nor a pre-feasibility study or a feasibility study.[39]

Revenue estimates, capital costs ("CAPEX"), operating expenditures ("OPEX"), royalties, environmental levies and taxes are necessary to make a cash flow projection.[40] Goto and Yamazaki have estimated the CAPEX and OPEX of cobalt crusts based on nodule mining.[41] The OPEX of seabed mining, including transport to shore, is estimated to be between $70–140/tonne of ore.[42] Necessary processing costs increase OPEX an additional $150–260/tonne of ore.[43] There is no efficient extraction method for manganese yet available. CAPEX is expected to be 50% of nodule mining, and OPEX is 45%.[44] A 2020 Report notes that:

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[38] VALMIN, *supra* note 28 at 23; *CIMVAL*, *supra* note 32.
[39] AMC Consultants Pty Ltd, *Technical Report Summary, Initial Assessment of the NORI Property, Clarion-Clipperton Zone for Deep Green Metals Inc. made in accordance with the requirements of SEC Regulation S*-K (subpart 1300) AMC Project 321012 (London, 2021) at 181; AMC, *Technical Report NORI Area D Clarion Clipperton Zone Mineral Resource Estimate Deep Green Metals Inc*. AMC Project 318010 (Brisbane: Australia, 2019).
[40] The total CAPEX value is the quantum of investment required to further the project. CAPEX includes development costs that must be paid upfront, and sustaining CAPEX distributed over the project's life. The OPEX is a unit cost per sales ton. Actual quotations and calculations must support the OPEX list. CAPEX and OPEX have not been fully quantified for seabed mining, making valuation and investment decisions possible.
[41] Goto, Koji et al., *Preliminary Economic Feasibility Analysis of Cobalt-Rich Manganese Crust Mining for Rare Metal Recovery* (2010).
[42] *Ibid* at 10.
[43] Marcel Rozemeijer, et al., "Seabed Mining" in Kate Johnson & Gordon Dalton, eds, *Blue Growth and the New Maritime Economy* (The Netherlands: River Publishers, 2018).
[44] Goto et al, *supra* note 41 at 11.

> Capital costs have been estimated for the construction of the processing facility to handle 4.88 Mt (dry) of nodules per year. The estimate has been developed according to the Association for the Advancement of Cost Engineering Class 5 level of accuracy (–35% +50%). The owner's costs and escalation beyond 2019 are excluded. A closure cost of US$500 million has been allowed in 2046 for remediation of the on-shore minerals processing facility. Very little infrastructure is expected to be established in the seafloor production areas. Therefore, closure costs associated with offshore activities, including post-closure monitoring, are not expected to be material to the IA cost estimates.[45]

Several studies show positive rates of return for sulphides and nodules, but all studies show negative returns for cobalt crusts.[46] Under spot and expected future market prices, there is no viable business case for mining cobalt crusts.[47] The Japanese contractor Oil, Gas & Metals National Corporation ("JOGMEC") used an extractive cutter to be the first to complete an excavation test for cobalt but did not have positive financial results.[48] In other words, there is no business case for cobalt crust mining.[49]

Partially, this is due to the lack of viable forward-looking information in public disclosure documents. Once a social discount rate is applied (as discussed below), rates of return fall dramatically to the point that profitability becomes a real issue for the contractors. Royalty rates for the ISA and Sponsoring States have not been set. MIT lowered their forecasts from three (3) megatonnes ("MT") to 2.4MT per annum, much lower than the 4.88MT estimated by others. A sustainable seabed mining valuation code must deal with these discrepancies.[50]

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[45] RMG Consulting, *Analysis of Tax Regimes in 15 Countries - Annex* (ISA, 2020); RMG Consulting, *Comparative Analysis of Tax Regimes of Land-Based Mining in 15 Countries* (ISA, 2020); CRU Consulting & RMG Consulting, *Joint summary of the reports prepared by CRU and RMG Consulting relating to a Comparative Analysis of the Financial Aspects of Seabed Mining and Land-Based Mining* (2020)

[46] Rozemeijer et al, *supra* note 43.

[47] *Ibid* at 115, 121.

[48] JOGMEC, "JOGMEC Conducts World's First Successful Excavation of Cobalt-Rich Seabed in the Deep Ocean" online: http://www.jogmec.go.jp/english/news/release/news_01_000033.html. JOGMEC is an incorporated administrative agency, which is similar to a Crown corporation in Canada. JOGMEC, *Integrated 2018 Report online:* http://www.jogmec.go.jp/content/300350621.pdf at 21, 45. JOGMEC also supplies and stockpiles Japan's coal and oil reserves.

[49] Ecorys, *Study in support of Impact Assessment work for Ocean Energy* FWC MARE/2012/06 – SC C1/2012/01 (EC DG Maritime Affairs and Fisheries, 2013); Ecorys, *Study to investigate state of knowledge of Deep Sea Mining* FWC MARE/2012/06-SC E1/2013/04 (Rotterdam/Brussels: European Commission - DG Maritime Affairs and Fisheries, 2014); Ecorys, *Unsustainable Finance in the Blue Economy: Where Does the Money Come From? Recommendations Report* (Prepared for European Commission, September 2020); CRU Consulting & RMG Consulting, *supra* note 45; Rozemeijer et al, *supra* note 43.

[50] A recent TMC report downgraded annual capacity of 1.3MT per year; see AMC, *supra* note 39.

In the land-based mining context, practitioners of a valuation code must undertake suitable checks, enquiries, analyses and verification procedures that meet the reasonable grounds requirement for the soundness of the inputs that lead to the conclusions drawn in a public report. The data and information must not have been rendered invalid due to the passage of time and circumstances at the date of the technical assessment or valuation. Such changes may include capital and operating cost structures, exploration techniques, geological interpretation, mining, and metallurgical technologies.[51] A reasonable grounds requirement should also be included in a sustainable seabed mining valuation code. A reasonableness test means the practitioner must perform an impartial assessment to determine if the overall Valuation Approach, Valuation Method and Valuation, or Technical Assessment is reasonable. Such a test will serve to identify Technical Assessments and Valuations that may be out of line with industry standards and norms, meet the Reasonable Grounds Requirement, and make a positive statement that the inputs, assumptions, Valuation Approaches, Valuation Methods and Technical Assessment or Valuation meet the Reasonable Grounds Requirement, and not disclaim liability for the Valuation Approach, Valuation Method and Valuation, or Technical Assessment.[52]

The issue lies in the metals in the nodules, sulphides and crusts. Companies should disclose the actual assumed prices. Referring to a spot price without disclosing the price used in calculating the metal equivalent is insufficient. Where the actual prices used are commercially sensitive, the company must disclose sufficient information, in narrative rather than numerical form, for investors to understand its methodology to determine these prices. Further,

[51] VALMIN, *supra* note 28 at 17.
[52] *Ibid* at 13; Society for Mining, Metallurgy, and Exploration, Inc, *SME Standards and Guidelines for Valuation of Mineral Properties* 2nd ed. (SME, 2017); *SME Guide for Reporting Exploration Information*, Mineral Resources and Mineral Reserves Resources and Reserves Committee (Society for Mining, Metallurgy and Exploration, Inc., 2017).

metallurgical recoveries for all metals and a discussion of the basis on which the assumed recoveries are derived must be included.

Additionally, a clear statement is that it is the company's opinion that all the elements included in the metal equivalents calculation have a reasonable potential to be recovered and sold and the calculation formula used in the valuation. Estimates of metallurgical recoveries for each metal must be used to calculate meaningful metal equivalents. Reporting based on metal equivalents is inappropriate if metallurgical recovery information is unavailable or cannot be estimated reasonably. For many projects at the Exploration Results stage, metallurgical recovery information may not be available or can be estimated with reasonable confidence. In such cases, reporting metal equivalents may be misleading.[53] This is problematic in seabed mining, as no recovery process has been designed. Thus, a seabed mining valuation code should incorporate best practices from their terrestrial counterparts.

Why does this matter? International investment law is part of the relationship between the contractor and the Sponsoring State.[54] As such, the certainty of fiscal royalty and taxation measures allows governments to reduce the volatility of revenue inflows to aid economic and fiscal planning. Seabed mining activities have early-adoption risks, presenting financiers and investors with unclear, ambiguous, and potentially incorrect data.[55] Any Sponsoring State that decides to issue seabed mining rights within national jurisdiction must also set and enforce rules for conducting those activities. The ISA's costs are likely significant, given the extensive monitoring and compliance system it must deploy to ensure that the seabed mining regime is

[53] JORC Code, *supra* note 35 at 24.
[54] Alberto Pecoraro, "Deep Seabed Mining in the Area: is international investment law relevant?" (10 July 2019) *EJIL Talk!* https://www.ejiltalk.org/deep-seabed-mining-in-the-area-is-international-investment-law-relevant/.
[55] Allianz, "Deep Sea Mining" online: https://www.agcs.allianz.com/news-and-insights/expert-risk-articles/esg-risk-briefing-4-2019.html.

implemented effectively.[56] Estimating costs accurately is essential to the success of seabed mining. One of the factors of this uncertainty is the price of commercial metals: it could be such that the contractors' work is not profitable. Since no commercial-scale extraction of seabed minerals is currently taking place, no seabed mining technologies or project designs have been implemented where researchers can fully appraise the effects of the industry once in production. There are several mining royalty formulas, and each type has its characteristics.[57] An accurate estimate is a goal of a terrestrial mining valuation code. It should be a goal for a sustainable seabed mining valuation code, presumably which is also a public interest concern.

3. Value Nature and the Circular Economy (Ecosystem Principle)

Capital and wealth are based on assets, not necessarily income, and do not include law and nature.[58] It seems apparent that seabed mining will cause some net loss of biodiversity.[59] The destruction or disturbance of seafloor ecosystems with waste disposal and sediment plumes caused by seafloor disturbance will also impact marine floral and faunal communities.[60] How, then, should finance minimize environmental impact? What language do we want/need to ensure transparency and public participation? What are the roles of the LTC and the Council in the event of Serious Harm or a threat of Serious Harm?[61]

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[56] Dingwall, Joanna, *International Law and Corporate Actors in Deep Seabed Mining* (Oxford University Press, 2021); Joanna Dingwall, "Commercial Mining Activities in the Deep Seabed beyond National Jurisdiction: the International Legal Framework" in Catherine Banet, ed, *The Law of the Seabed* (Leiden/Boston: Brill, 2020).
[57] JOGMEC, *Comments on Developing a Regulatory Framework for Mineral Exploitation in the Area (March 2015)* (Japan, 2015).
[58] Katharina Pistor, "A legal theory of finance" (2013) 41:2 Journal of Comparative Economics 315; Katharina Pistor, Capital's global rule" (2019) 26:3 Constellations 430; Aguilera, Ruth & Cynthia Williams, "Law and finance: inaccurate, incomplete, and important. (Evaluating Legal Origins Theory Symposium)" (2009) 6 BYULR 1413; Gerhard Schnyder, Mathias Siems & Ruth Aguilera, "Twenty Years of 'Law & Finance': Time to Take Law Seriously" (2018) IDEAS Working Paper Series from RePEc.
[59] Data requirements in a circular economy are addressed below. The lack of data poses challenges for valuation of minerals.
[60] Roland Cormier & Jemma Londsdale, "Risk assessment for deep sea mining: An overview of risk" (2020) 114 Marine Policy 103485.
[61] For example, see comments by Ambassadors Figueroa and Guillen-Grillo, "Information Working Group" online: https://isa.org.jm/files/files/documents/IWG-IA-Presentation.pdf (accessed 22 November 2022).

From an investor perspective, a concern is that the ISA and the seabed mining contractors are operating on a set of untested assumptions, namely that seabed mining will raise significant revenue to stimulate national economic development while preventing severe harm to the marine environment.[62] The risk of environmental and nature-based harms creates financial risks. The greater the risk to the income stream, the lower the amount of money that can be borrowed today using this as collateral. Lenders will require a higher interest rate to compensate for the lending risk they bear; therefore, the present value will be lower.[63]

The *Draft Exploitation Regulations* define serious harm to the marine environment 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 ISA's rules, regulations and procedures and based on internationally recognized standards and practices informed by the best available scientific evidence.[64] The *Draft Exploitation Regulations* do not establish an expectation to reinstate a degraded ecosystem to the same state and functioning before it was degraded. What constitutes "significant adverse change" or when harm becomes "serious harm" remains unclear. Rehabilitation emphasizes the reparation of ecosystem processes, productivity and services. Restoration may involve land reclamation or ecosystem rehabilitation to repair project impacts and return specific functions and biodiversity features to the ecosystems concerned. Restoration goals also include partial or complete re-establishing the pre-existing biotic integrity regarding species composition and community structure. Monitoring is conducted to ensure that no serious harm is caused to the marine environment from activities

[62] Anton & Kim, *supra* note 15.
[63] Michael Seeger, *Mining Capital* (Switzerland: Springer, 2019).
[64] Neil Craik, "Implementing adaptive management in deep seabed mining: Legal and institutional challenges" (2020) 114 Marine Policy 1; Neil Craik, *Determining the Standard for Liability for Environmental Harm from Deep Seabed Mining Activities* CIGI Liability Series for Deep Seabed Mining-Report 2 (CIGI, 2018) at 2.

associated with the project.[65] Operationalizing the definition of serious harm will be necessary to provide a practical benchmark against which success criteria can be developed for mitigation and monitoring.[66]

A sustainable seabed mining valuation code would assist in the internalization of environmental costs of exploitation activities in the Area into the production costs of minerals from the Area. It would be integral to the orderly, safe, and rational management of the Area's resources. It would assist in valuing the efficient conduct of activities in the Area and avoiding unnecessary waste as mandated by UNCLOS Article 150.

VALMIN, as discussed in Chapter 4, requires certain data to be included in a valuation. A valuation requires information on land tenure, regional and local geology, mineralization, hosting potential, exploration and production history, extraction methods and design, and processing methods.[67] It also requires plans for environmental recovery. Financial requirements for valuations include the estimated capital and operating costs, actual and projected, or forward estimate, production, environmental, social and heritage impacts, JORC Code Modifying Factors and other aspects that could reasonably be expected to impact the economic potential, and product pricing and revenue factors.[68] Specifications on tenure include the tenure area, expiry and renewal dates, expenditure commitments, rents and rates, security bonds or reclamation liability, obligations to any third party, including, but not limited to, joint venture or royalty agreements, and title and location of any contiguous and geologically related Tenure that, in the opinion of the Practitioner, may have a Material bearing on the value of the tenure under

[65] ISA, *Recommendations for the guidance of contractors for the assessment of the possible environmental impacts arising from exploration for marine minerals in the Area* ISA Doc. ISBA/25/LTC/6/Rev.1 (30 March 2020).
[66] Craik, *supra* note 64 at 114, 115.
[67] VALMIN, *supra* note 28 at 21; *CIMVAL*, *supra* note 32; SME *supra* note 52.
[68] *Ibid*.

consideration.[69] The Australian ASX and ASIC further regulate the reporting of existing or proposed operating, environmental and social practices and must be reviewed to establish the operation's technical, economic, environmental and social feasibility.[70]

As discussed, the Capital Asset Pricing Model ("CAPM") estimates an appropriate markets-based risk premium.[71] Although metals prices are volatile, they are not highly pro-cyclical, which means that metals move with market conditions.[72] Risk premiums can also be estimated against all assets delivering a future consumption stream, including labour income derived from human capital. A market-based risk premium from the CAPM may be too large for an organization such as the ISA.

The Capital Asset Pricing Model for Nature, first introduced in Chapter 4, can be one potential proxy for environmental and biodiversity externalities.[73] Adding a weighted risk

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[69] VALMIN, *supra* note 28 at 23.

[70] *Ibid* at 24. Matters to be reviewed for Mineral Assets may include, but are not limited to:

(i) mining and processing methods,
(ii) grade control, mining loss and dilution,
(iii) geotechnical, hydrological and climatic conditions,
(iv) mineralogical and metallurgical factors likely to affect process recovery,
(v) flow sheet design,
(vi) variability of the mineralised body's physical and chemical properties,
(vii) metallurgical recoveries and performance,
(viii) tailings and waste disposal,
(ix) quantity and quality of final and intermediate products and waste, (x) labour sources, requirements and productivity,
(x) operating practices and technologies employed or to be employed; (xii) equipment availability, utilisation and performance,
(xi) energy and water sources,
(xii) recent trial mining and treatment data (for proposed operations),
(xiii) construction and commissioning schedules,
(xiv) marketability of products, revenue factors, commodity prices and exchange rates,
(xv) product transport and realisation issues,
(xvi) environmental, legal, statutory and social constraints and commitments, and
(xvii) closure and post-closure activities and schedules.

[71] Freeman, Groom & Turk, *supra* note 24; Seeger, *supra* note 63; Eli Fenichel & Joshua K Abbott, "Natural Capital: From Metaphor to Measurement" (2014) 1:1/2 Journal of the Association of Environmental and Resource Economists 1.

[72] For example, Freeman estimated a risk premium of 1% for the ISA using this market-based approach. A more international approach and using equity premiums for developed markets would lead to a larger estimate.

[73] Yun, Seong Do, Eli P Fenichel & Joshua K Abbott, CAPn: Capital Asset Pricing for Nature (2017); Fenichel, Eli & Yukiko Hashida, "Choice and the Value of Natural Capital" (2019) 35:1 Oxford Review of Economic Policy 120.

premium to account for systematic risk in metals prices and the need for critical minerals is insufficient.[74] The ISA aims to maximize social welfare internationally at any given time and intertemporally across generations, which is not the objective of investors.[75]

Investors are concerned about the incremental risk that new projects contribute to their existing portfolio of assets. As described in Chapter 5, the risk premium depends on the systematic risk of the income stream, multiplied by an estimate of how much additional return investors require for each unit of risk. The risk depends on the overall uncertainty about the income stream and the correlation between the income stream and financial market movements. If the new income stream increases risk, the risk premium for environmental harm increases. The correlation between the contractual payments' income stream and the existing portfolio of assets determines the risk premium. Further, the importance of the non-financial and economic benefits of the environment must be recognized.[76] Yields only determined through market forces by investors looking to maximize returns on private capital should not dictate discounting choices by the ISA.

For example, CIMVAL requires a proponent to discuss available information on environmental, permitting, and social or community factors related to the Mineral Property being

[74] Lapteva Anna, Chernova Alexandra et al., *Study of the Potential Impact of Polymetallic Nodules Production from the Area on the Economies of Developing Land-based Producers of those Metals which are Likely to be Most Seriously Affected Advance Unedited Version* (All-Russian Scientific-Research Institute of Mineral Resources: ISA, 2020) at 192.

[75] William Nordhaus, "Revisiting the social cost of carbon." (2017) 114:7 Proceedings of the National Academy of Sciences of the United States of America 1518; Freeman, Groom & Turk, *supra* note 24; Freeman recommends that the ISA employs a real social discount rate of 3.75%. Nordhaus suggests a social discount rate of 6%. The specific number is irrelevant for this dissertation. Rather the process of creating one and the embedding of a rate (or something akin to it) should be conducted in financial analysis and mineral valuations.

[76] Kenneth Arrow et al., "Sustainability and the measurement of wealth" (2012) 17 Environment and Development Economics 317; Kenneth Arrow al, "Sustainability and the measurement of wealth: further reflections" (2013) 18:4 Environment and Development Economics 504; Nicholas Stern, "The Structure of Economic Modeling of the Potential Impacts of Climate Change: Grafting Gross Underestimation of Risk onto Already Narrow Science Models" (2013) 51:3 Journal of Economic Literature 838.

valued.[77] They further warrant disclosure of the environmental standards that must be met, the permits needed to continue work on the Mineral Property, their application status, and any limitations they may impose on the property's exploration, development, and production. Finally, a proponent must summarize the results of any environmental studies and discuss any known environmental issues that could materially impact the ability to establish mining operations on the Mineral Property and plans to mitigate them.

Mining projects may require funding from a financial institution that requires an environmental assessment.[78] Before licenses are issued, environmental impact assessments must be approved, including the techniques and mitigating actions concerning the environment.[79] Polymetallic nodules are unique.[80] Available data on seismic hazards are exclusively terrestrial, allowing the assessment of ESG risks only for the land-based components of seabed mining.[81] Scientific knowledge of the impact of seabed mining wastes is likely to be developed incrementally on a project-by-project basis, limiting the ability to accurately predict individual and cumulative impacts of seabed mining operations.[82] Studies on the environmental and social risks of terrestrial mining have problems with the paucity of superior quality, high resolution, and up-to-date global data. Seabed mining proponents must be prepared to commission environmental studies that are significantly more complex, time-consuming, and costly than those typically commissioned for terrestrial mining. Regulators require institutional capacity,

[77] *CIMVAL*, *supra* note 32.
[78] Collins, Patrick Colman et al., "A primer for the Environmental Impact Assessment of mining at seafloor massive sulfide deposits" (2013) 42 Marine Policy 198; Thompson, Kirsten et al., "Seabed Mining and Approaches to Governance of the Deep Seabed" (2018) 5 Frontiers in Marine Science.
[79] AMC Consultants, *supra* note 39; Allianz, *supra* note 55.
[80] CRU Consulting, *supra* note 2.
[81] Anthony Kung et al, "Governing deep sea mining in the face of uncertainty" (2021) 279 J Environ Manage 111593.
[82] *Ibid*. Approximately 13% of deposits coincided with marine protected areas, with most overlaps located in the Pacific. Technical aspects of geological sampling and mineral processing are likely to differ from those used currently in terrestrial operations, notwithstanding that extracting seabed minerals will require novel technologies.

including the expertise, availability, support staff, and information systems to oversee these studies and ensure they are critically reviewed before approval decisions.

However, environmental assessments are often not integrated into financial models. A sustainable seabed mining valuation code must incorporate qualitative data into a mineral valuation analysis. MIT noted that this was a weakness in their model and needed to be addressed. Germany and Costa Rica (from the quote in the introductory paragraph) also noted this fact. The CAPn model, or other environmental externality analysis tool, should be embedded in such a mining code. A comparative assessment of the cost of seabed mining and ore extraction by different methods on land, the cost of processing polymetallic nodules with the production of marketable metal products, with the cost of similar products is needed.[83] The revealed behaviour of society conditional on the state of resource stocks under existing institutions, including environmental regulations and cultural norms, implies a value for resource stocks conditional on a criterion for measuring economic welfare.[84] Studies must assess the technological, financial, economic, and market aspects of extracting metals other than copper, nickel, cobalt, and manganese from polymetallic nodules.

As part of a framework, mining entities should submit integrated social, economic and environmental assessments together with proposed mitigation or management measures, identify and quantify opportunities and propose programs that lead to the creation of sustainable benefits, including acceptable plans for the eventual closure of the mine and the provision of adequate financial assurance to cover the costs of closure and any ongoing monitoring.[85] Further, they should have appropriate environmental management standards in place for the use of surface and

[83] *Ibid* at 804.
[84] Fenichel & Abbott, "Natural Capital", *supra* note 73.
[85] IGF, *supra* note 23; R David Espinoza & Jeremy Morris, "Towards sustainable mining (part II): Accounting for mine reclamation and post reclamation care liabilities" (2017) 52 Resources Policy 29 at 35.

groundwater. These standards would be strictly monitored and have appropriate penalties should they be compromised. Included in a framework valuation code, firms must identify, monitor and address potential and actual risks and impacts to biodiversity throughout the mining cycle, and require that mining entities conduct ongoing monitoring, compile and submit performance assessments to the government, and publish regular reports readily accessible to the public. Finally, a sustainable seabed mining valuation code should incorporate a sustainable mining framework, as discussed in Chapters 3 and 4.

An additional aspect of environmental externalities and seabed mining is climate change.[86] Global climate change governance is best understood as a regime complex in which a cluster of sub-regimes is loosely aligned or connected. Heinrich et al. attempt to calculate the environmental impacts of seabed emissions.[87] They conclude that there will be significant carbon emissions from seabed mining and emphasize the need to integrate emissions into the regulatory regimes concerned with climate change, air pollution and shipping.[88] While outside the scope, pricing carbon through taxation or other mechanisms is the primary way to align carbon, climate and environmental externalities into a financial model.[89] As such, carbon pricing will be a part of a seabed mining valuation code.

Finally, pricing models could also trigger further terrestrial and recycling efforts.[90] A nation's mineral riches are thus likely to remain an important foundation for economic and social

[86] Robin Warner, "Preserving a balanced ocean: regulating climate change mitigation activities in marine areas beyond national jurisdiction" (2007) 14 Aust ILJ 99.
[87] Luise Heinricha, Andrea Koschinskya et al., "Quantifying the fuel consumption, greenhouse gas emissions and air pollution of a potential commercial manganese nodule mining operation" (2020) 114 Marine Policy 103678.
[88] *Ibid* at 6, 11.
[89] Nordhaus, *supra* note 75; Paul Jensen, Phil Purnell & Anne Velenturf, "Highlighting the need to embed circular economy in low carbon infrastructure decommissioning: The case of offshore wind" (2020) 24 Sustainable production and consumption 266; David Wright & Meinhard Doelle, "Social Cost of Carbon in Environmental Impact Assessment" (2019) 53:3 UBC Law Rev.
[90] AMC Consultants, *supra* note 39; Golder Associates, *NI 43-101 Technical Report for the NORI Clarion Clipperton Zone Project*, No. 1897074 (2018).

development. Six factors include the intensity and severity of the impact, the spatial extent of the impact relative to habitat availability, sensitivity and vulnerability of the ecosystem to the impact, the ability of the ecosystem to recover, the extent of ecosystem alteration, and the timing and duration of the impact relative to species and habitat needs.[91] The long-term impacts materially influence financial models but are not incorporated by the ISA. A sustainable seabed mining valuation code would incorporate recycling and a circular economy.

Building such a model will require significant stakeholder input. For example, countries may consider joint endeavours for technical, environmental, or financial issues specific to a mineral or mining method and joint baseline data assessment. They may consider collaboration on national mining rules. Sponsoring States could assist each other with legal, contractual, training, assessments, baseline studies, or ISA engagement.[92] Regional approaches might include joint due diligence, review of environmental impact assessments, vessel monitoring, or royalty calculations. Regional or sub-regional cooperation could facilitate activities such as marine spatial planning and strategic environmental assessment on a regional scale, managing transboundary impacts, impacts on migratory species, or cumulative impacts where different potential mining sites are located close to each other but in different national jurisdictions. A regional environmental finance body could be mandated to hold, analyze, and share (as appropriate) geological and environmental data for the region's benefit, enabling regional analysis and allowing the environmental data gathered from research in one country's marine

[91] *Ibid*.
[92] Hannah Lily, "A regional deep-sea minerals treaty for the Pacific Islands?" (2016) 70 Marine Policy 220–226 at 225; UNEP, *Action Plan for managing the Natural Resources and environment of the South Pacific* UNEP Regional Seas Reports and Studies 29 (UNEP, 1983).

space (an expensive process) to be used to inform another country's environmental management and planning.[93] Governance is further canvassed as Principle 5 below.

4. Value Equality (Principle of Equality)

Securities law has traditionally regulated corporate disclosure of financial information, such as income statements and investment risks. By contrast, human rights law has traditionally operated internationally and focused on State obligations.[94] Carefully crafted securities regulation can bridge the translation gaps between the business and human rights communities. Moreover, given the materiality of human rights risks, securities regulation is an appropriate forum for conveying information about these risks to investors.[95] Mandatory disclosure can create a level playing field and reduce any competitive disadvantage associated with a commitment to human rights. Disclosure can provide information to the public to correct information asymmetries, promote consent or deliberation, and change the firm's behaviour by making managers aware of their organization's social outputs.[96] As such, a sustainable seabed mining valuation code should incorporate human rights and equality principles.

Seabed mining may not generate the same extent of terrestrial land-use disturbance or human rights issues; however, the need for ports, worker accommodation, and processing facilities in at least one jurisdiction indicates that some of the same land-use competition will be replicated across the mineral supply chain.[97] Offshore mining's long-term employment opportunities will be limited to a few hundred high-skilled positions per project, relatively low

[93] Lily, *supra* note 92.
[94] Galit Sarfaty, "Human rights meets Securities Regulation" (2013) 54:1 Virginia Journal of International Law 125.
[95] *Ibid*.
[96] JOGMEC, *supra* note 57 at 28.
[97] Rozemeijer et al, *supra* note 43; Filer, Colin & Jennifer Gabriel, "How could Nautilus Minerals get a social licence to operate the world's first deep sea mine?" (2018) 95:C Marine Policy 394.

compared to land-based mining or recycling sectors.[98] When looking at the entire value chain, treatment and processing factories should open the door to a greater need for labour supply. A skilled labour force is a critical and critical component of future development.[99]

The 2011 *UN Guiding Principles on Business and Human Rights* states that a company should adopt financial reporting requirements that clarify that human rights impacts, in some instances, can be material or significant to the economic performance of the business enterprise.[100] Items such as respecting human rights and cultural heritage are included to ensure domestic policies and laws are consistent with international law and norms. Principle 3, for example, encourages and, where appropriate, requires business enterprises to communicate how they address their human rights impacts. The commentary adds that financial reporting requirements should clarify that human rights impacts could be "material" or "significant" to the economic performance of the business enterprise.[101] Further, commentary under Principle 21 asserts that communication can take various forms, including in-person meetings, online dialogues, consultation with affected stakeholders, and formal public reports. Formal reporting is evolving from traditional annual and corporate responsibility/sustainability reports to include online updates and integrated financial and non-financial reports.[102]

The socioeconomic plan to resolve or reduce the potential for social valuation disputes can be guided by international norms such as those represented by the International Finance Corporation *Performance Standards on Social and Environmental Sustainability* and the

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[98] Rozemeijer et al, *supra* note 43.
[99] Glenn-Marie Lange, Quentin Wodon & Kevin Carey, *The Changing Wealth of Nations 2018: Building a Sustainable Future* (Washington, DC: World Bank Group, 2018) at 14.
[100] UNDP, *Guiding Principles on Business and Human Rights,* online: *https://www.ohchr.org/sites/default/files/Documents/Publications/GuidingPrinciplesBusinessHR_EN.pdf*.
[101] *Ibid* at Principle 3(d), Commentary, at 6.
[102] *Ibid* at Principle 21, Commentary at 24.

Voluntary Principles on Security and Human Rights.[103] Operating entities should act to protect human rights and ensure miners' safety, families, and communities following the OECD guidelines. Concerning Indigenous peoples, governments and mining entities should respect the spirit and intent of current and future international normative language, as found in the *International Finance Corporation Performance Standards*. While there are codes and voluntary initiatives relevant to the mining industry, governments set the example and support sustainability when they implement basic international instruments (*Universal Declaration of Human Rights, UN Declaration on the Rights of Indigenous People, Maritime Labour Convention*) as well as instruments specific to mining (*Convention on Safety and Health in Mines*).[104] Governments may consider how to benefit from initiatives such as the *Extractive Industries Transparency Initiative*.[105] Benefits should use different mechanisms to maximize the transparency, understanding and acceptance of how the direct financial flows from mining operations are apportioned in ways appropriate to their political and legal systems.[106] The question becomes how to incorporate socioeconomic factors into a valuation code.

Indicators are playing an increasingly significant role in regulatory governance.[107] Indicators address a visceral desire of policymakers to find mechanisms that can increase

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[103] IFC, *IFC Performance Standards on Environmental and Social Sustainability Effective* (1 January 2012) online: https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/publications/publications_handbook_pps; *Voluntary Principles on Security and Human Rights*, online: https://www.voluntaryprinciples.org/; *Maritime Labour Convention, 2006,* (adopted by the International Labour Conference at its 94th (Maritime) Session (2006 Amendments approved by the International Labour Conference at its 107th Session (2018)).

[104] Nele Matz-Luck, "The Impact of OSPAR on protected area management beyond national jurisdiction" (2014) 49 Marine Policy 155.

[105] EITI, online: https://eiti.org/; NRCan, "Extractive Sector Transparency" online: https://www.nrcan.gc.ca/our-natural-resources/minerals-mining/extractive-sector-transparency-measures-act/18180 (accessed 21 November 2022).

[106] Simon Deakin et al, "Legal institutionalism: Capitalism and the constitutive role of law" (2017) 45:1 Journal of Comparative Economics 188.

[107] Kevin Davis, *Governance by Indicators: Global Power through Classification and Rankings* (Oxford University Press, 2012); Kevin Davis, Benedict Kingsbury & Sally Engle Merry, "Indicators as a Technology of Global Governance" (2012) 46:1 Law & Society Review 71.

compliance with rules, particularly acute in international law.[108] An indicator is a named, rank-ordered representation of past or projected performance by different units that use numerical data to simplify a more complex social phenomenon, drawing on scientific expertise and methodology. The representation can be used to compare particular units of analysis (such as countries or persons) and evaluate their performance by referencing one or more standards. Indicators serve as second-order abstractions of statistical information and evaluate performance according to a standard.[109] These indicators protect creditors and investors by helping transform qualitative data into quantitative information.[110] This quantitative information can then be incorporated into the valuation code. Additional information on data requirements is presented below. The Mining Policy Framework's social provisions, which could be adopted into the sustainable seabed mining valuation code, could assist the Enterprise with its social assessment.

5. Make all Valuations Public (Principle of Transparency)

> Transparency and Transparent means a clear and unambiguous presentation of the Valuation in the Valuation Report, which includes all Material information on which the Valuation is based, such that the reader can understand the Valuation and not be misled.[111]

As noted in Chapter 6, governance is the formal and informal arrangements, institutions, and mores that determine how resources are utilized and what rules and sanctions are applied to environmental damage.[112] The governance study examines the distribution of rights, obligations and power that underpin organizations. In 2011, the Seabed Disputes Chamber noted that the current contractual arrangements lack transparency, such that verifying that contractors and the

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[108] Galit Sarfaty, "Regulating through numbers: a case study of corporate sustainability reporting" (2013) 53:3 Virginia Journal of International Law 621.
[109] *Ibid*.
[110] Haselmann Rainer, Katharina Pistor & Vikrant Vig, "How Law Affects Lending" (2010) 23:2 The Review of Financial Studies 549.
[111] *CIMVAL*, *supra* note 59 at 6; JORC *supra* note 35 at 4.
[112] Charles Gonthier, "Sustainable Development and the Law" (2005) 18:1 McGill JSDLP 11; MIDAS, *Implications of MIDAS Results for Policy Makers: Recommendations for Future Regulation*s Grant Agreement No. 603418 (2016).

Sponsoring State have met their obligations will be difficult.[113] Private contractual arrangements alone cannot satisfy the obligation undertaken by the Sponsoring State. The ITLOS Chamber sees the lack of transparency that can arise from confidential contractual arrangements as a hindrance to properly implementing the Common Heritage of Mankind.[114] Ensuring that valuation methods are publicly available for all contractors must be included in a valuation code.

Oveson, Hackett et al. discuss a seabed fiscal management framework, highlighting the need for transparency.[115] Jaeckel asserts that the ISA faces two main challenges concerning the increasing demand for greater transparency and accountability of its operations, including specific provisions for stakeholder participation and the lack of publicly available data. Christiansen et al. claim that the current lack of public access to environmental data impedes the establishment of environmental baselines.[116] The gaps in environmental data for the ocean floor (biodiversity, waste, water) create uncertainties that will necessitate intensive research and integration into valuations.

Governance by the ISA is fragmented, and currently, environmental assessments are not standardized or independently verified.[117] The LTC, which deals with financial-related matters, holds meetings in closed sessions.[118] The ISA faces two main challenges concerning the increasing demands for greater transparency and accountability of its operations. The first is the law of specific provisions for stakeholder participation, and the second is the lack of publicly

[113] *Responsibilities and Obligations of States Sponsoring Persons and Entities with Respect to Activities in the Area* (Seabed Advisory Opinion), [2011] ITLOS Case No 17 at para 225.
[114] *Ibid* at para 226.
[115] Vidar Ovesen et al., "Managing deep sea mining revenues for the public good- ensuring transparency and distribution equity" (2018) 95 Marine Policy 332 at 333.
[116] Sabine Christiansen et al., *Towards Transparent Governance of Deep Seabed Mining* (IASS Policy Brief, 2016) at 4.
[117] Thompson et al, *supra* note 78.
[118] *Ibid* at 3.

available data.[119] The ISA acknowledges that the lack of transparency in decision-making undermines its credibility.[120]

Environmental justice enables communities to participate meaningfully in development decisions to prevent or mitigate environmental harm before it occurs.[121] Open, transparent decision-making processes are required in which all voices are heard, including those with less political and socioeconomic power and privilege.[122] Decision-making processes should include the ability of all relevant actors to participate fully and effectively during the decision-making processes of the ISA. Ardron identifies acceptable practices in transparency that could lead to improved accountability in governance. These practices include allowing countervailing opinions, adding additional parties and issues, eliminating the inevitability of ISA decisions, allowing parties the opportunity for gain, allowing for trade-offs in negotiation, and better implementing a participative regulatory process.[123]

Community engagement establishes and maintains a constructive relationship with affected communities over the project's life. An effective engagement process allows the community's views, interests and concerns to be heard, understood, and considered in project decisions and in creating developmental benefits. It also allows the community to understand

[119] Jeff Ardron, "Transparency in the operations of the International Seabed Authority: An initial assessment" (2018) 95:C Marine Policy 324; Jeff Ardron, Henry Ruhl & Daniel Jones, "Incorporating transparency into the governance of deep-seabed mining in the Area beyond national jurisdiction" (2018) 89:C Marine Policy 58.
[120] David Johnson, *Periodic Review of the International Seabed Authority pursuant to UNCLOS Article 154 –* Interim Report (2016) at 79.
[121] Robert Makgill, Aline Jaeckel & Keith MacMaster, "Implementing the precautionary approach for deep seabed mining: a review of state practice" Virginie Campanella, ed, *Routledge Handbook of Seabed Mining* (Routledge, 2022).
[122] Nathalie J Chalifour & Gavin Smith, "The pursuit of environmental justice in the McLachlin court (The Supreme Court of Canada and Social Justice: Commitment, Retrenchment or Retreat)" (2010) 50 Supreme Court L Rev 538.
[123] Ardron, *supra* note 119; Ardron, Ruhl & Jones, *supra* note 119.

mining better, its opportunities and challenges. The *Seabed Advisory Opinion* was the first time an environmental not-for-profit was given status in an international tribunal.[124]

Increased transparency should be linked to additional participation options, enabling all stakeholders to submit remarks and objections beyond the context of application review procedures. Open meetings would enhance the credibility and legitimacy of the LTC. Mechanisms are in place which should prevent their remarks and objections from being considered in the decision-making process to approve or reject a work plan. In land-based mining valuation codes, a public report gathers, summarizes and interprets material information related to the Mineral Assets under consideration along with the opinions of the practitioner, which are to be presented clearly, concisely and accurately.[125] A public report must contain all the information that the commissioning entity (in this case, the ISA) would require and expect to find to make an informed decision. The process and the report must be as transparent, objective and rigorous as the data and other material information available will allow.[126] Conclusions and key assumptions must be disclosed and discussed. This may include assessing Mineral Resources and Reserves, extraction, mining, processing, marketing, valuation, mine closure and tenure issues, and the methodology or methodologies used, which must be set out in the report.[127] These criteria should be mandatory in the seabed mining context, ensuring that all contractors are subject to transparency, not just the publicly traded entities and that all seabed mining contractors will be treated equally.

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[124] Anna Dolidze, "Advisory opinion on responsibility and liability for international seabed mining (ITLOS case no. 17) and the future of NGO participation in the international legal process" (2013) 19:2 ILSA Journal of International & Comparative Law 379; 2011 *Seabed Advisory Opinion*, *supra* note 562.
[125] VALMIN, *supra* note 28 at 15.
[126] VALMIN, *supra* note 28; *CIMVAL*, *supra* note 32; *Part 229—Standard Instructions for Filing Forms Under Securities Act of 1933, Securities Exchange Act of 1934 and Energy Policy and Conservation Act of 1975* Regulation S-K, 17 CFR Part §229 at s 229.1301.
[127] VALMIN, *supra* note 28 at 12.

6. Standardize Valuation to avoid Regulatory Capture (Principle of Integrity and Public Interest)

As introduced in Chapter 1, regulatory capture entails special interest groups having undue influence on a regulatory body. Regulatory capture is the process and effect of regulated entities or industries systematically redirecting regulation away from the public interest and toward regulated parties' private, special interests.

For instance, a mining participant will be eager to extract a resource rent. It may not want to share valuable information on financial matters or technologies. Meanwhile, an environmental group eager to limit production to curb pollution may also want to enact overly stringent regulations or discount and limit gains in production technologies. [128] Further, regulators may wish to advance public goals of environmental stewardship.

Due to certain capital costs that are fixed, extractives and utilities have pricing concerns. Once a regulatory body sets the price, the companies under current rate-setting regimes potentially have a profit incentive to encourage significant increases in consumption over and above forecast levels, which directly contradicts the objective of energy efficiency standards.[129] However, an asymmetry of knowledge of costs between the contractor, regulator and the public makes these costs opaque.

[128] Laffont, J.-J., & Tirole, J. (1991). The Politics of Government Decision-Making: A Theory of Regulatory Capture. The Quarterly Journal of Economics, 106(4), 1089; David Thaw, "Enlightened Regulatory Capture" (2014) 89 Washington Law Review 329 at 330.; MacLean, J. (2016). Striking at the root problem of Canadian environmental law: identifying and escaping regulatory capture. Journal of Environmental Law and Practice, 29, 111

[129] Daniel Carpenter & David Moss, "Introduction" in Daniel Carpenter & David A Moss, eds, *Preventing Regulatory Capture: Special Interest Influence and How to Limit It* (New York: Cambridge University Press, 2014) at 13; Brink Lindsey & Steven Teles, *The Captured Economy: How the Powerful Enrich Themselves, Slow Down Growth, and Increase Inequality* (New York: Oxford University Press, 2017). Croucher, M. (2011). Are energy efficiency standards within the electricity sector a form of regulatory capture? Energy Policy, 39(6), 3602

Results of empirical studies demonstrate many examples of regulatory capture generating results contrary to the public interest or at least servicing a small subset of private or State interests. Regulatory capture evokes negative connotations of backroom dealing, placement of industry-friendly individuals in key regulatory positions, and the breakdown of the regulatory process. Carpenter and Moss propose a three-step approach of general jurisdictional application to identifying regulatory capture. The three steps will identify a defeasible, precise and falsifiable public interest, illustrate a policy shift away from the public interest toward industry interest, and demonstrate action and intent by the industry in pursuing this policy shift.[130]

The regulatory capture focus in this dissertation is primarily on the information asymmetry that special interest groups may have. That is, corporations have data on financial dealings and technology that regulators are not privy to or do not share with the public. Setting an appropriate base rate for minerals then needs to be transparent and avoid any discretion from the contractor or regulator. This would also ensure that additional regulation is not considered voluntary, soft or out of line with other standards, such as the GRI, as noted in previous chapters.

Information asymmetry, which may lead to regulatory capture, is potentially prevalent in seabed mining. Closed door meetings took place between ISA members and Nautilus Minerals executives (now owned by TMC) to secure reserved areas before the company secured sponsorship from a developing State.[131] It is precisely these same areas of reserved parts of the Area that Nauru and Tonga reserved for NORI and TOML.[132] The lack of a valuation code

[130] David Carpenter & David Moss, *Regulatory Capture: Special Interest Influence and How to Limit it* (New York: Cambridge University Press, 2013). affont, J.-J., & Tirole, J. (1991). The Politics of Government Decision-Making: A Theory of Regulatory Capture. The Quarterly Journal of Economics, 106(4), 1089
[131] New York Times, *Seabed Mining Selected Documents 2022*, online: https://www.documentcloud.org/documents/22266044-seabed-mining-selected-documents-2022 at 13, 17, 21.
[132] *Ibid* at 13, 47, 54.

means that the ISA hides the problems of mining technology, contractor ownership, and lack of public data. While private involvement can have socially undesirable effects, ignoring private expertise overlooks valuable technical information about the regulated subject matter.

Given that the Sponsoring State could be strategically chosen from the beginning, issues of the regulatory race to the bottom and choosing Sponsoring States of convenience seem like a real possibility. Depending on the content of the national legislation on seabed mining and how strictly it is enforced, private enterprises can choose to register their principal place of business in a certain State and apply for sponsorship. Many of the details are held as confidential and thus not subject to public scrutiny. The financial arrangements depend on the agreement negotiated between the individual State and the sponsored contractor, which is not currently public.

Mining companies need to share the commercial benefits of the project with the host country and the global investing community. Once access to relevant information and equitable sharing of benefits is obtained, the recognition of pluralistic interests is attached to mankind and the recognition of all relevant actors and their diverse interests. Governments must put clear, comprehensive and transparent laws, policies and regulations in place, build strong institutions, train skilled professionals and set up accountability mechanisms to implement policy frameworks and rules.[133] Examining the transplantation of corporate governance practices allows us to understand how countries, industries, and firms are selective in their environmental, social, financial, and corporate governance practices.[134]

[133] CL Van Dover et al, "Scientific rationale and international obligations for protection of active hydrothermal vent ecosystems from deep-sea mining" (2018) 90 Marine Policy 20.
[134] Max Weber, "Central Counterparties in the OTC Derivatives Market from the Perspective of the Legal Theory of Finance, Financial Market Stability and the Public Good" (2016) 17:1 Eur Bus Org Law Rev 71; Kyle Hatton & Katharina Pistor, "Maximizing autonomy in the shadow of great powers: the political economy of sovereign wealth funds" (2011) 50:1 Columbia Journal of Transnational Law 1; Aguilera & Williams, *supra* note 54.

Financial considerations do not account for actual costs that need to be included in analyses. A bank will find an enterprise attractive for loans if its security interest in the equipment is legally recognized and protected by a system of law.[135] The bank could seize assets, such as ships, rigs, and other equipment, for repayment.[136] Publicly available seabed mining valuation codes would assist investors by bringing contractual information between contractors, Sponsoring States and the ISA to light.

Systemically standardizing and aligning a valuation code with other global metrics would also avoid a misalignment of priorities, ensuring environmental regulation is complete, has no missing gaps and is aligned with other financial arrangements.

7. Integration with Other Financial Arrangements (Principle of Performance and Financial Accountability)

> Discuss any potential social or community-related requirements and plans for the Mineral Property and the status of any negotiations or agreements with local communities. Describe plans for bonding, pre-closure remediation, reclamation, closure plan, and post-closure responsibilities.[137]

Economic channelling means that the operator bears the financial liability burden of any harm but has a right of recourse against the subcontractors that may have been responsible, including suppliers and equipment designers.[138] Sustainable mining frameworks advocate for developing financial assurance mechanisms for mine closure by ensuring that financial assurance for closure and post-closure expenses is present and adequate to the task and by adopting legislation, regulations and guidelines for financial assurance. These would require an adequate level of

[135] Erik Rosaeg, "Framework Legislation for Commercial Activities in the Area" in Catherine Banet, ed, The Law of the Seabed (Leiden/Boston: Brill, 2020).
[136] *International Convention on Maritime Liens and Mortgages*, A/CONF.16217 (6 May 1993).
[137] *CIMVAL*, *supra* note 32 at 27.
[138] Neil Craik, *Determining the Standard for Liability for Environmental Harm from Deep Seabed Mining Activities CIGI Liability Series for Deep Seabed Mining* - Report 2 (CIGI, 2018) at 12.

financial assurance based on realistic estimates to cover the cost of all outstanding work programmes at any time, including premature closure and the conduct of closure programmes by third-party contractors if the mine operator is unable or unavailable to complete the work, and require that each closure plan and its cost estimates be validated or approved by the responsible authorities. The range of compensable damage is defined and typically includes losses to persons and property and environmental damage, including reinstatement costs incurred, but typically not awarding compensation for a pure environmental loss.[139]

The EIA review process has not yet been finalized. The *Draft Exploitation Regulations* outline the application process, and the conditions contractors must implement during operations, while the *Draft Standards and Guidelines* deal with technical matters. All contractors have been informed that the ISA requires completing the Environmental and Social Impact Assessment ("ESIA") studies, culminating in an EIS to support their applications for an exploitation license. To accomplish this, the ISA would need to establish appropriate forms of financial security (bonds, insurance), including their specific details and conditions; require that the financial securities be issued or held only by qualified and approved financial institutions; give governments the right to gain immediate and unencumbered access to the full amount of the financial assurance securities, and allow the draw-down or release of security instruments only as each work programme or other requirement is satisfied.

In land-based mining, companies have to set aside funds to guarantee that rehabilitation and clean-up in case of accidents can be made even if the company, for whatever reason (bankruptcy, for example), has to stop its operations. Another way of combating environmentally dangerous pollution, which could be seen as a form of environmental levy, is

[139] *Ibid* at 16; Guifang (Julia) Xue, *The Use of Compensation Funds, Insurance and Other Financial Security in Environmental Liability Schemes*, CIGI Report 6 (Waterloo, ON: CIGI, 2019).

requiring companies by law to set aside certain amounts to use in the future for rehabilitation and in case of accidents.[140] Problems arise when the contractor is insolvent, or the Sponsoring State takes all necessary and appropriate measures required by the UNCLOS and *Draft Exploitation Regulations*.[141] However, should damage occur, the Sponsoring State has failed to take the required measures, or failure is not causally linked to environmental harm, then none of the current compensation mechanisms would 'kick in' and contribute to the payment for remediation.[142]

A seabed mining valuation code would thus need to integrate (and be integrated with) other environmental and financial arrangements. These arrangements may include the Environmental Compensation Fund, the Guarantee, insurance, closure and rehabilitation plans, and environmental management and monitoring plans. Other inputs in the valuation code would require the use of external experts by entities to contribute to the development of closure plans and to validate the risk assessments, studies and activities associated with high-risk elements such as tailings dams, waste dumps and acid rock drainage; requiring that internationally accepted guidelines and best practices (such as *IFC Performance Standards on Social & Environmental Sustainability*) be followed, and requiring the periodic reassessment and independent auditing of closure plans. The Exploration and *Draft Exploitation Regulations* do not define review processes for the post-closure mining phase and the final performance assessment.

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[140] Andrés Sebastián Rojas & Freedom-Kai Phillips, *Effective Control and Deep Seabed Mining: Toward a Definition* (Waterloo: CIGI, 2019); Xue, *supra* note 141 at 1; *Draft Regulations on Exploitation of Mineral Resources in the Area* (2019), ISBA/25/C/WP1 at Regulations 54, 55, 56; MIT Group, Financial Payment System Modeling for Polymetallic Nodules Presentation to International Seabed Authority Open Ended Working Group on Financial Modeling (7 November 2022) online: https://www.isa.org.jm/wp-content/uploads/2023/03/Financial_Model_November_2022.pdf.

[141] *Seabed Advisory Opinion*, *supra* note 113.

[142] *Ibid*.

The contractor remains fully responsible and liable under the contract and approved plan of work, regardless of any Guarantee provided. Affiliates, related companies, sub-contractors or other entities cannot discharge this responsibility. This remains a critical gap in the Guarantee, as it would be appropriate if a parent company, which has greater resources (or access to them), were co-signing the Guarantee. For example, TMC could guarantee the operations of DeepGreen and NORI. Costa Rica believes that the Guarantee should cover a contractor's closure-related obligations and any other environmental-related costs that the contractor cannot or is unwilling to cover, including in cases of bankruptcy or other situations of insolvency and throughout the life of the exploitation contract as well as beyond the closing of the operation.[143] Costa Rica does not agree with the approach taken by the LTC, where they state that there should be a balance so that the Guarantee does not hinder the ability of the contractors to participate in the activities in the Area.

The table below summarizes these comparisons and gaps, highlighting the lack of environmental and social considerations.

[143] Costa Rica, *Template for the review of the draft standards and guidelines associated with the Draft regulations on exploitation of mineral resources in the Area*, online: https://isa.org.jm/files/files/documents/Costa%20Rica.%20Draft%20standard%20and%20guidelines%20environmental%20performance%20guarantee%20.pdf.

Table 1: Summary of Financial Mechanisms

	Insurance	Royalties	Environmental Compensation Fund (Compensation Fund)	Seabed Sustainability Fund	Environmental performance guarantee
Purpose of mechanism	Insurance guarantees that financial responsibility can be taken when damages occur.	The ISA collects royalties and will distribute payments to developing nations based on the principles of the common heritage of mankind.	ECF should provide adequate funds to remedy environmental damage.	The seabed sustainability fund is to be used to finance research and innovation, competency building in developing human capital and funding other sustainability-related goals.	Cover the costs associated with the closure of activities, namely premature closure, decommissioning and final closure, including removing any installations and equipment post-closure, monitoring and managing residual environmental effects.
Source of funds	There are various methods of insurance, including insurance companies and mutual insurance (protection and indemnity clubs).	As proposed by the MIT group, three different royalty models for the ISA: value-based/ad-valorem models, profit-based, and unit-based.	Prescribed percentage or amount of fees paid, a percentage of any penalties paid, and a percentage of any amounts recovered by the ISA because of legal proceedings in respect of a violation of the terms of an exploitation contract, monies directed to be paid into the Compensation Fund, and income received by the investments in the Compensation Fund	The seabed sustainability fund created funds by investing existing funds to generate income and attract other contributions as start-up capital.	Self-funding mechanisms.
Issues or discrepancies	Currently, no insurance standard or guideline exists for contractors to undertake seabed mining.	Current royalty models lack emphasis on intergenerational equity and principles of equitable sharing.	ISA Technical Study 27 notes that insurance against accidental damages to the marine environment will strain the Environmental Compensation Fund less, allowing the fund to act as a backup option in circumstances where both the contractor and the insurer cannot pay for the damages. The authors included a 1% amount for a seabed environmental compensation fund in the MIT model.	There remains the possibility that the fund could be used to pay for activities, including research, which ISA contractors should be responsible for independently. Furthermore, its narrow scope has been criticized for excluding social aspects of sustainability within its funding mandate.	The ISA does not endorse any single cost estimation tool for calculating the Guarantee. Instead, an Applicant or Contractor may use any reasonable cost-estimation tool, provided it suits the proposed operations, resulting in a sufficient calculation to cover the scope.

One standardized valuation method would ensure that all financial mechanisms, regardless of when or who wrote them, follow the same protocols and procedures. Thus, the mechanisms would not need to be rewritten to ensure harmony between them. However, they would also need to share data to ensure the underlying minerals could be valued similarly.

8. Data Valuation Requirements (Principle of Verification)

> The specialist must accept responsibility for assessing the technical data and information, interpretations, discussions and conclusions, forecasts and parameters used in a Technical Assessment or Valuation of a Mineral Asset. For Mineral Asset Valuations undertaken, the specialist must also accept responsibility for the Valuation Approach, Valuation Methods and Public Report conclusion.[1]

There is really a lot of data to analyze before you can make an assessment of environmental impacts. The ongoing generation of and access to baseline environmental and financial information is required. Generating baseline geological, topographical and other information for project planning and making that information readily available to all stakeholders is needed for a positive dialogue. Data requirements shall also consider the social, economic and political factors affecting the various components of marine biodiversity. Land based mining valuation codes mandate the collection and implementation of data collection and robust monitoring protocols. As such, data collection requirements must form part of a seabed mineral valuation code. The code should include provisions promoting information sharing and collaboration to avoid the race to the bottom that can arise when countries compete against each other. Financial arrangements should include information sharing in developing national fiscal regimes and financial terms of licensing agreements. Public participation is required to disseminate more information regarding the content of contracts and annual reports by introducing specific templates.[2]

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[1] VALMIN, *supra* note 28 at 18.
[2] UNEP, *Roadmap for a Sustainable Financial System* (UNEP, 2017) at 186.

In order to implement its data management strategy, the ISA launched DeepData, an online database collecting environmental data and biodiversity information garnered through exploration activities in the Area.[3] However, financial information is not included. Adding financial information to this database could provide the valuation information necessary for the code. Additional information can be found in the supply chain and other digital technologies.

The rise of digital financing structures will have profound implications for the mining industry.[4] One new instrument, blockchain, may overcome other types of risk, including supply chain and counterparty risk. A blockchain is a distributed ledger that can record and verify transactions on a computer network without the help of a centralized institution such as an exchange or clearinghouse. It secures the finality of a transaction by preventing alterations after the process is verified. Blockchain could assist in tracking the ore throughout all stages and can be used to identify better legal issues (such as who caused the harm and the amount of harm done). It will assist in valuation through smart contracts, smart loans and digital tokens.

For example, as described, cobalt mining is known for severe environmental and social issues. Yet, cobalt is currently necessary for battery production. The path for mining cobalt is complex and opaque. IBM, a large corporation, recently partnered with Ford Motor Company, LG Chem and other partners on a blockchain network to bring more transparency to mineral traceability.[5] This blockchain could help enforce international frameworks such as the OECD Due Diligence Guidelines and the other sustainable frameworks introduced in Chapter 6.[6] In a

[3] ISA, "DeepData" online: DeepData Database | International Seabed Authority (isa.org.jm).
[4] White & Case LLP, "Rise of digital finance: Tokenizing mining & metals assets" online: https://www.whitecase.com/publications/insight/rise-digital-finance-tokenising-mining-metals-assets.
[5] IBM, "How Blockchain Can Help Modernize the Mining Industry" online: https://newsroom.ibm.com/How-Blockchain-Can-Help-Modernize-the-Mining-Industry. (accessed 22 June 2023).
[6] *Ibid*.

diamond mining context, blockchain is used to help enforce the Kimberley Process Certification Scheme (KP) to eliminate the circulation of 'conflict diamonds.'[7]

Smart contracts are self-executing programs that run on a blockchain.[8] Smart loans can hold digitized information such as loan clauses and collateral ownership and integrate with automated business logic relating to repayment and loan servicing.[9] Digital token offerings and blockchain could become an alternative to supplement financing options available to mining companies as they represent a new stream/royalty financing form.[10] Tokenized financing uses the intrinsic value of a mineral deposit or its production, which is then listed on third-party exchanges to facilitate trading and liquidity.[11] For example, TradeLens is a blockchain-enabled digital platform for tracking containerized cargo developed in a joint partnership between Maersk and IBM. It gives businesses and authorities along the supply chain a sole source of shipping data with one non-modifiable record of transactions.[12] These (and other) technologies could be used as a template for data sourcing requirements for a mineral valuation code.[13]

[7] Filipe Calvão & Matthew Archer, "Digital extraction: Blockchain traceability in mineral supply chains" (2021) 87 Political Geography 102381.
[8] Alex LaPlante, Alexey Rubtsov & Charlotte Watson, *Smart Contracts: Financial Innovation* (GRI, 2022).
[9] B3i, "What We Do" online: https://b3i.tech/what-we-do.html.
[10] Mining com, "Digital financing emerging as funding option for cash-strapped miners " (14 June 2019) online: https://www.mining.com/digital-financing-emerging-as-funding-option-for-cash-strapped-miners-report/; Lori Stein & Evan Thomas, "CSA issues guidance that securities legislation likely applies to custodial cryptoasset trading platforms" Osler, Hoskin & Harcourt LLP online: http://www.osler.com/en/resources/regulations/2020/csa-issues.
[11] Feldfisher, "Alternative financing for the mining industry: what are the options?" (25 March 2019) online: Mining Technology https://www.mining-technology.com/features/alternative-financing-for-the-mining-industry/.
[12] Marex, "Maersk's Blockchain Trade Platform Gains Traction with Ports" online: *The Maritime Executive* https://www.maritime-executive.com/article/maersk-s-blockchain-trade-platform-gains-traction-with-ports.
[13] Specific technologies are beyond scope of this dissertation. The aim of the paragraph was to show that there are technological based solutions that could house and utilize data in a more efficient fashion that could help integrate financial concerns into a seabed mining valuation code.

9. Allow Regional Approaches (Principle of Flexibility)

Specialist valuators are required to give a valuation report. A one size fits all valuation code may not work. A regional approach could better manage national seabed mineral resources, yielding more benefits and minimizing adverse socioeconomic and environmental impacts.[14] There would be regional technical requirements upon which States and contractors can call to conduct specific regulatory functions. Examples of such functions might be due diligence into an applicant company before awarding a national licence, review of an environmental impact assessment report, on-vessel monitoring, or royalty calculation. Using a regional body for seabed mineral regulatory work can build country capacity, provide independent expertise, and remain within the regional knowledge base, enabling learning from other mining activities.

Sub-regional approaches could also be considered. Countries whose national deposits include nodules, crusts or sulphides may work jointly on technical, environmental, or financial issues specific to that mineral type. Countries at the exploration stage may consider assimilating the requirements of explorers or joint assessment of baseline data collected. Regional or sub-regional valuations should consolidate formal commitment to existing legal principles. Further examples of more detailed content that a regional approach may contain include a requirement for signatories to establish a funded and qualified national seabed minerals regulatory authority with relevant designated responsibilities and functions. These should include appropriate powers and functions to implement stringent monitoring and an enforcement and sanctions regime for seabed mineral activities within national jurisdiction.

[14] Lily, *supra* note 92.

10. Revise terrestrial mining codes (Principle of Fairness)

> Mining codes and standards revised and updated to reflect changing knowledge and best practice. They should deal with all aspects of mining from exploration to closure and post-closure management. The data and reporting requirements by entities should be made explicit in exploration and operating licences so that authorities can make informed decisions.[15]

Mining codes and standards must be updated to reflect changing knowledge and best practices. They should deal with all aspects of mining, from exploration to closure and post-closure management. Data and reporting requirements should be explicit in exploration and operating licences so that authorities can make informed decisions. The recommendations from this dissertation, in order to implement, will require national securities regulators to update their terrestrial mining codes to reflect the proposed principles. While beyond the scope of this dissertation, national regulators should (regardless of the seabed mining requirements) update their codes to incorporate environmental, circular economy, social and human rights principles.

[15] IGF, *supra* note 23 at 7.

7.2 Suggestions for a Way Forward – Table of Contents for the Sustainable Seabed Mining Valuation Code

Below, I set out a potential table of contents for the sustainable seabed mining valuation code. It amalgamates CIMVAL and VALMIN requirements with the capital asset pricing model for nature and the sustainable finance frameworks described in earlier chapters. While a sustainable seabed mineral valuation code would require multi-stakeholder input, this table of contents could provide the necessary starting point to help all parties.

Sustainable Seabed Mining Valuation Code
Table of Contents

Risk

11.1 Risk Factors

11.2 Integration of Environmental or Impact Assessment Report

This table of contents could help the ISA, especially the LTC and drafters of such a code with their discussions.

7.3 Implementing the Code

I assert that the best way to implement the Sustainable Seabed Mining Valuation Code is through an amendment to the Draft Exploitation Regulations and a Standard. The *Draft Exploitation Regulations* would add a regulation similar to the technical valuation requirements under the Canadian NI 43-101 or the United States Regulation S-K. Secondarily, the Draft Exploitation would add a provision to ensure this valuation is used over all financial mechanisms, including royalty payments, the Environmental Compensation Fund and the Environmental Performance Guarantee.

The next step would be to have the ISA draft a specific valuation Standard, the sustainable seabed mining valuation code. As the Standard would be incorporated by reference by the Exploitation Regulations, this Standard would have the force of law. The ISA Recommendation would form part of the Standard for mineral reserve and resource estimates. The valuation code would become the second part of this Standard. This Standard would be developed by a multi-stakeholder process that includes valuators, financiers, insurance companies, environmental groups, and other interested parties. The rationale has its theoretical backing from the Legal Theory of Finance. Finance is law. But private parties with contractual obligations can only go so far, especially when their corporate future is at stake.

7.4 The Legal Theory of Finance Revisited

The Legal Theory of Finance postulates that there is a false dichotomy between law and finance. Most research separates the two as mutually exclusive. The LTF asserts that "capital rules, and it rules by law."[16] Global finance is impossible without legal rules that enable asset holders to carry their local rules with them or, if they prefer, to opt into foreign law.[17] This puts a greater emphasis on the law as normally envisioned. However, as one author argues, given the importance of law in creating capital, it seems that much work – perhaps too much – is demanded of law.[18] Financial mechanisms need to work with the law. The seabed mining valuation code would assist in properly valuing seabed minerals. This valuation would be incorporated into royalty formulae, environmental compensation funds, and insurance, among others. The environmental and social components would incorporate the Common Heritage of Mankind and intergenerational equity. Thus, the connection between law and finance should be apparent.

Pistor's LTF shows that capital relies on more than enforceable contracts and clear property rights that are enforceable against the world. Capital depends on shielding assets that lock in past gains and protect asset pools from all but the direct creditors of the firm.[19] Law, then, can help transform any asset into wealth and shield this wealth from those who need it, including the environment. And therein lies an issue. The Draft Exploitation Regulations are still being drafted. They have the power to shape the law of seabed mining for generations. But the

[16] Pistor, Katharina, The Code of Capital: How the Law Creates Wealth and Inequality (Princeton University Press, 2019) at 201.
[17] Ibid at 7.
[18] Marco Goldoni, "On the Constitutive Performativity of the Law of Capital" Sage Journals Online (University of Glasgow) online: https://journals.sagepub.com/doi/full/10.1177/0964663920966488; Katharina Pistor, "The Code of Capital: How the Law Creates Wealth and Inequality" (2021) 30:2 Social & Legal Studies 291. https://doi.org/10.1177/0964663920966488
[19] Pistor, supra note 16 at 47.

Draft Exploitation Regulations do more than shape the law. The financial provisions shape a contractor's profit, the Common Heritage of Mankind, intergenerational equity and environmental protections. That is a lot to put on the shoulders of Draft Regulations.

Another important contribution by Pistor is the effect of institutionalism.[20] Seabed mining renews the power of institutions. The ISA is a unique international regulation-making body. The unique types of actors in seabed mining are vastly different from their land-based mining counterparts. The concepts of sponsoring states and processing states add levels of complexity. However, Pistor points out that missing is the relationship between social norms and institutions. The ISA is effectively the "keeper" of the Common Heritage of Mankind. Its mandate to implement intergenerational and intragenerational equity is unique.

But the LTF also connotes the power of central powers. Seabed mining is unique, with different actors. Some actors are corporations from the Global North. Most contacts are with traditional powers (Germany, France, Belgium, South Korea, Japan, etc.) The financing will most likely come from large Western financial institutions. Insurance will likely come from the same marine insurance institutions (Lloyd's, Gard) as before. Thus, the same powers could entrench themselves into this nascent industry. This is all consistent and expands upon the LTF.

However, seabed mining could flip finance and the LTF due to Common Heritage and the involvement of developing States. Nauru, Tonga, China, Jamaica, and others have the power to transform the financial periphery into the financial nexus. Fifty (50%) of reserved areas are exclusively designed for developing States. As such, should these areas have commercially significant quantities of minerals, they may be able to escape the resource curse that has plagued

[20] Simon Deakin et al., "Legal Institutionalism: Capitalism and the Constitutive Role of Law" (2017) 45:1 Journal of Comparative Economics 188; Geoffrey Hodgson, "Observations on the legal theory of finance," (2013) 41:2 Journal of Comparative Economics 331.

land-based mining developing States. On the other hand, research points to seabed mining having a significantly negative impact on land-based mining in developing States, which could once again exaggerate and make the centralization of mining finance worse.

The complexity could also lead to regulatory capture. The need to have a multistakeholder approach when developing royalty models or an insurance scheme, with all their inherent complexities and uncertainties, could drive solutions to the large corporations and developed States with the know-how and expertise gained from land-based mining operations. The result is that the regulations, whether by drafting or application, are consistently or repeatedly directed away from the public interest and toward the regulated industry's interests. The dissertation has shown several examples where TMC's filings to the ISA were accepted as is but were rejected or clarified by the Securities and Exchange Commission.

As described in the previous chapter, capture can take various forms: subsidies, control of entry by competitors, and price-setting, among others. The ISA is currently setting the price of royalties based on incorrect and incomplete pricing of the seabed minerals. A valuation code would set the prices correctly and would be standardized in such a way as to minimize or eliminate the potential of regulatory capture. Finally, the dissertation expands upon the definition of capital for the LTF. Capital must be more broadly defined than traditional assets, know-how, etc. Natural Capital, Social Capital, and Environmental capital must form a central part of any financial model. CAPn, the social cost of carbon, and social discounting are beyond mere theories or nice-to-haves in financial models. They are integral to the veracity of financial models, royalty payments and the Common Heritage of Mankind. A sustainable seabed mining valuation code will help ensure minerals are properly valued and the goals of the Common Heritage of Mankind are achieved. The environmental and social factors could also limit any

regulatory capture in that special interests could not overcome a standardized model that is made publicly available. All contractors would be on equal footing, and stakeholders would have increased access to more information.

7.5 Conclusion

Chapter 7 has argued that the ISA should establish a robust, sustainable seabed mining valuation code. Building on previous chapters, the ten principles incorporate sustainability into a land-based mining valuation code and make it feasible for application to the seabed mining context. The final principle requires updating land-based valuation codes to include environmental and social valuation techniques. The current lack of a valuation code makes it possible (and probable) that contractors grossly overvalue the minerals found on the seabed and grossly undervalue nature and biodiversity. Short of a moratorium on seabed mining, this valuation code could help ensure the greatest protections of the marine environment as envisioned by Article 145 of UNCLOS, while valuing equity will ensure the Common Heritage of Mankind, as stated in Article 139, is achieved.

Chapter 8 - Conclusion

8.0 Complexities of a Seabed Valuation Code

This thesis has demonstrated that creating a sustainable seabed mining valuation code, modelled after land-based valuation codes but with added and strengthened environmental and social protections, is feasible. Sustainable Development must be reframed to ensure the highest environmental and social protection levels. Moreover, the Common Heritage of Mankind and equitable sharing of financial and non-financial benefits must be incorporated into the regulatory framework. This sustainable seabed mining valuation code would incorporate the precautionary approach, the ecosystem approach, the internalization of environmental costs, and the Common Heritage of Mankind and would help value unknown biodiversity factors. Aligning this code with other frameworks, such as the *IGF Mining Policy Framework* and the *Towards Sustainable Mining* protocols, while at the same time updating these frameworks with the most up-to-date sustainable development principles, will ensure that seabed mining, if operationalized, could become safe and secure.

8.1. Revisiting the Dissertation Questions

At this point, returning to the main dissertation questions is appropriate. The first question was how the legal framework for seabed mining finance in the international seabed area might be envisioned to enable an environmentally and socially sustainable industry for the low-carbon world. The second was how does the law shape the financing of seabed mining such that a mineral asset valuation code could be developed to assist contractors with the sustainable exploitation of minerals found on the seabed?

8.1.1 Legal Framework for Seabed Mining Finance as an Enabler of an Environmentally and Socially Sustainable Industry for the Low Carbon World

> We have not covered a first reading of more than 30% of the Regulations. For each paragraph there are several proposals and in many cases very different views from delegations. We are very far from agreeing on a financial mechanism, much less on the royalties; we are very far from agreeing on the Benefit Sharing mechanism; we have not operationalized the Enterprise, nor the Economic Planning Commission. We have not gone over the Standards and Guidelines even one, and only Phase One Draft Standards and Guidelines have been prepared. It is absolutely unreal to believe that the Council will finish the regulations by 2023 or 2024. Maybe by 2025. But this does not mean that because we finish the Regulations, we will be ready to mine because if we don't invest enough in Marine Scientific Research in order to be able to establish environmental baselines for each region, we won't be able to assess what is needed to comply with the obligation to protect the marine environment.[1]

As this opening quote illustrates, the Mining Code is incomplete and not ready for enactment. Significant gaps still exist in the *Draft Exploitation Regulations* and the *Draft Standards and Guidelines*. Absent a moratorium, there are still solutions to these problems. There is time to make the amendments and additions required. The Mining Code can be an enabler of environmentally and socially sustainable practices.

Any mining operation's financial capabilities depend on the underlying minerals' valuation. Valuation assumptions are related to the prices of the underlying minerals, technical feasibility, and the need to ensure an adequate rate of return on investment. Investors are reluctant to fund an operation without a feasibility study. Additional ISA resources are needed to fund a study on the valuation of minerals in underlying areas before a financier makes any investment. UNCLOS mandates the protection of the marine environment, and the *Seabed Advisory Opinion* cements sustainable development into the framework for seabed mining.

Nodules, sulphides and crusts have unique characteristics. As earlier chapters illustrate, exploration regulations exist for nodules, sulphides and crusts. However, the *Draft Exploitation Regulations* and all *Draft Standards and Guidelines* abandon this in favour of provisions that

[1] New York Times, "Statement from Guillen Grillo" (November 2022) online: https://int.nyt.com/data/documenttools/2022-11-costa-rica-permanent-representative-to-isa-georgina-guillen-grillo-statement/8bc4fa95bea26199/full.pdf.

cover all three. To date, the ISA has done substantial work creating provisions for an Environmental Compensation Fund, standards for the Environmental Performance Guarantee, and royalty models. The ISA has not yet created enough guidance on insurance nor integrated environmental and social externalities into any of these frameworks.

Further, the proposed models of royalties currently lack emphasis on intergenerational and international equitable sharing of economic benefits and material resources from seabed mining operations. Most importantly, the ISA has not integrated these frameworks nor insured that all of these funds, guarantees, and frameworks cover all potential gaps in the remediation and reclamation of environmental damage from deep sea mining. For example, the ISA uses market values for equitable compensation through its current mechanism of an environmental compensation fund, a seabed sustainability fund, and an environmental performance guarantee. However, the market prices used to value these assets may provide misleading signals about the costs and benefits of land conversion.

As noted in Chapter 6, while the financial mechanisms are developed separately for technical reasons, they all must align with equitable sharing and the Common Heritage of Mankind. These mechanisms should be integrated, and environmental and social externalities should be accounted for in the overall calculation of the royalty rate. As illustrated in Chapter 7, a seabed mining valuation code would help align and integrate valuations and externalities into these mechanisms. The biggest example is in a model which required each mine site to generate an annual commercial production of three million tons of wet (now dry) nodules per year over

twenty (20) years.[2] TMC and others predict no more than 1.5MT dry nodules, about 50% of the MIT studies. Further research will assist the ISA in creating such a valuation methodology.

As discussed in Chapter 4, Pistor's LTF connects law and finance. As the previous example just illustrated, making a base assumption of 3MT wet tons, 3MT dry tons, or 1.4 MT dry tons goes beyond a simple one mining operation difference. This assumption drives all other calculations. Thus, the amount of ore partially drives the royalty calculation, which drives the development of the *Draft Exploitation Regulations*.

For example, TMC indicates that the project will generate approximately US$7.2 billion in undiscounted royalties payable to the ISA and Nauru and US$9.1 billion in onshore corporate tax payable to the host nation of the process plant. [3] Capital payback is expected 6.6 years after the start of production.[4] This is highly dubious, especially with the SEC's concerns over TMC's valuation methods.

> We have estimated the size and quality of our resources in the NORI and TOML contracted areas in our SEC Regulation S-K (subpart 1300), referred to herein as the SEC Mining Rules, compliant Technical Report Summary - Initial Assessment, of the NORI Property, Clarion-Clipperton Zone, Pacific Ocean dated March 17, 2021, or the NORI Initial Assessment, and Technical Report Summary - TOML Mineral Resource, Clarion - Clipperton Zone, Pacific Ocean dated March 26, 2021, or the TOML Mineral Resource Statement, respectively, prepared by AMC Consultants Ltd.[5]

After discussing with the SEC, TMC had additional insight into its expected costs, refined its cash flow analysis, and disclosed these insights in its March 2022 quarterly report.[6] This report disclosed that additional cash resources might be required to fund operations due to changes in

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[2] Agustina Merdekawati, et al., "Challenges for operationalizing autonomous Enterprise: what to overcome?" (2022) Australian Journal of Maritime and ocean affairs 1; Agustina Merdekawati & I Made Andi Arsana, "Equity Interest Scheme in Polymetallic Nodules Deep Seabed Mining: The Positives and Negatives" (2022) 29:1 Jurnal Media Hukum Web at 40.
[3] SEC, *Letter to TMC Re Amendment No. 1 to Post-Effective Amendment No. 1 to Registration Statement on Form S-1 Filed May 31, 2022* (21 June 2022) online: https://www.sec.gov/Archives/edgar/data/1798562/000000000022006651/filename1.pdf
[4] *Ibid*.
[5] TMC, *Prospectus Supplement No. 8,* Registration No. 333-267479 (22 December 2022) online: https://www.sec.gov/Archives/edgar/data/1798562/000110465922129606/tm2233215d1_424b5.htm at S-3.
[6] TMC, *Q2 Quarterly Report under SEC Form 10Q* (31 March 2022).

business conditions, including deferral of approvals, capital and operating cost escalation, currently unrecognized technical and development challenges or changes in the external business environment.[7]

What this also shows is the alignment between valuation and domestic securities laws. This is precisely what the LTF postulates.

The CIMVAL, VALMIN, SME, and SAMVAL all contain different provisions, some stronger in environmental protections and some weaker in valuation techniques. A key change in the approach used by the ISA would be requiring all contractors to make their valuations public, akin to trade corporate disclosure requirements publicly. This would apply to the Enterprise, State owned entities and private corporations. It would give investors confidence in valuations, so they may be more willing to provide additional funding to complete feasibility studies, environmental impacts and social valuations. The generation of baseline geological, topographical and other information for national land use planning and making that information available to individuals, communities and other civil society actors with equal access to ensure that consultations between different parties can occur on an equal footing. [8] Other benefits include increasing capacities for negotiating mining contracts, better addressing the fungible nature of mining profits and transfer pricing, dealing with commodity price volatility and tying the financial benefits of mining to local, regional and national development objectives.

In summation, and as illustrated in Chapter 5, any fund, whether the Seabed Sustainability Fund or Environmental Compensation Fund, must be adequately capitalized or

[7] TMC, *Q3 Quarterly Report under SEC Form 10Q/A* (30 September 2022) online: https://www.sec.gov/ix?doc=/Archives/edgar/data/0001798562/000110465922118962/tmc-20220930x10qa.htm.
[8] IGF, *IGF Mining Policy Framework, Mining and Sustainable Development* October 2013 at 7;

funded by all applicants, not just contractors with approved plans of work. One or two contractors alone would not contribute sufficient capital to ensure that either fund would have the necessary amount to achieve their mandates. The Guarantee, proposed in the *Draft Exploitation Regulations*, should have a concrete formula and eliminate the self-guaranteed models to ensure that funds will be available to pay the Guarantee.

One key recommendation is the creation of an insurance model and standard that is appropriately capitalized and valued in order to ensure all possible environmental damages arising from deep sea mining projects in the Area and not reliant on self-insuring mechanisms in order to decrease the reliance on and overuse of the Environmental Compensation Fund or EPG as they are underfunded and would not be able to support remediation for all sites. The ISA should continue researching insurance and look to other legal frameworks to build their insurance standards and guidelines.

Thus, a seabed mining valuation code can assist contractors regardless of their incorporation status. It would comfort publicly traded entities as they would not be unduly disadvantaged with their public filings, as all contractors would have to disclose the same amount of information. It could help a fictional entity, the Enterprise, become viable, as it would give joint venture partners comfort in their mineral valuations.

TMC also claims that the low interest of investors is inextricably linked to doubts about the sector's financial performance.[9] If seabed mining were indeed the lucrative industry it is always envisioned and expected to be, why would investors be reluctant to invest? Partly, this is due to the lack of studies on the financial viability. TMC, for example, has disclosed in their public filings that its conceptual study of the potential viability of mineral resources in the

[9] *Ibid*. The SEC was concerned on this statement and has asked TMC to revise its cash flow statements.

NORI-D was not intended to establish a step-by-step roadmap on which the company could develop their strategic plan or operating budget. Rather, their forecasts are estimates that they would have enough cash on hand to meet its working capital and capital expenditure requirements to at least the third quarter of 2023.[10] As noted earlier, this 'aligns' with Nauru's imposed deadline to finalize the *Draft Exploitation Regulations*. But as discussed in Chapter 4, a mining workplan and plan of work must, in a land-based context, plan for the entire mining operation (roughly 30 years or so). This did not satisfy the SEC:

> We note that you had increased operating costs in 2021 compared to what you projected in the "Certain DeepGreen Projected Financial Information" disclosed.[11]

The SEC requested additional disclosure from TMC stating that it has cash beyond 2023 and to discuss its capital requirements into the third quarter of 2023, any changes to operating plans, including if they continue to anticipate conducting enough pre-project activities to decide to mine on the NORI Contract Area on or around 30 June 2023.[12] The SEC requested that TMC update its disclosure to provide updated information about the company's financial position and additional risks to the business operations and liquidity in light of these circumstances.

Not only are new investors not financing TMC's business, but existing investors are also exiting in significant numbers. The TMC redemption rate of the original investors was approximately 91%, and two major investors defaulted on their obligations to fund their

[10] TMC, *The Metals Company Provides Q2 2022 Corporate Update* (15 August 2022) online: https://www.sec.gov/Archives/edgar/data/1798562/000110465922091224/tm2223376d1_ex99-1.htm.
[11] SEC, *Letter to TMC Re: TMC the metals Co Inc. Post-Effective Amendment No.1 to Registration Statement on Form S-1 Filed 14 April 2022* File No. 333-260126 online: https://www.sec.gov/Archives/edgar/data/1798562/000000000022005095/filename1.pdf.
[12] *Ibid*.

committed investments.[13] The SEC was not only unconvinced at their financial projections, redemptions and capital; they warned TMC on their transparency:

> In light of the significant number of redemptions and the unlikelihood that the company will receive significant proceeds from exercises of the warrants because of the disparity between the exercise price of the warrants and the current trading price of your common stock, expand your discussion of capital resources to address any changes in the company's liquidity position since the business combination. If the company is likely to have to seek additional capital, discuss the effect of this offering on the company's ability to raise additional capital. Please also update your risk factors section accordingly. **We remind you that the company and its management are responsible for the accuracy and adequacy of their disclosures, notwithstanding any review, comments, action or absence of action by the staff.** [14]

In response, TMC restated their language to confirm they will need and are looking for additional cash sources.[15] More significantly, TMC now maintains that the NORI Technical Report[16] (the AMC report that is used as the primary source of Mineral Resources to the ISA) should not be used as a baseline, as cash outlays are expected to be incurred after the third quarter of 2023.[17] Furthermore, and in light of the SEC warning, TMC changed its financial forecasts, stating that in light of the significant deficit in expected funding, the updated budget and work plan will now focus solely on activities necessary for the expected submission of an application to the ISA for an exploitation contract over the NORI-D Area and removed all other allocated funds to capital expenditures.[18] This marks a substantial departure from their promises to the ISA and the public. Previously, they used their valuation and technical report to create a

[13] Mintz, Levin, Cohn, Ferris, Glovsky and Popeo, P.C., *Letter to SEC, Re Post-Effective Amendment No. 1 to Registration Statement on Form S-1 Filed April 14, 2022* (31 May 2022) online: https://www.sec.gov/Archives/edgar/data/1798562/000110465922066687/filename1.htm.
[14] SEC, Letter to TMC, *supra* note 11.
[15] TMC, Prospectus Supplement, *supra* note 5 at 31.
[16] AMC Consultants Pty Ltd, *Technical Report Summary, Initial Assessment of the NORI Property, Clarion-Clipperton Zone* made in accordance with the requirements of SEC Regulation S-K (subpart 1300) AMC Project 321012 (London, 2021); AMC, *Technical Report NORI Area D Clarion Clipperton Zone Mineral Resource Estimate,* AMC Project 318010 (Brisbane: Australia, 2019)
[17] TMC, Prospectus Supplement, *supra* note 5 at 35.
[18] *Ibid*.

full lifecycle budget for the potential development of the NORI-D Area, factoring capital and operating expenditures to bring the asset into commercial production.[19]

With their financial picture in jeopardy, late 2022 filings reveal that their contemplated scope has since been significantly narrowed compared to the scope of activities considered in the NORI Technical Report.[20] Several items changed, including a reduction in the conversion of the Hidden Gem into a commercial-ready vessel, the acquisition of a second drillship, offshore costs and onshore feasibility activities. They are now moving costs off their balance sheet for the Hidden Gem and onto that of Allseas. They will not acquire and convert a second drillship as originally included in the NORI Technical Report. They are moving millions in offshore costs needed for a valuation in the Technical Report and moving to Allseas. Finally, and crucially, they are deferring any onshore processing expenditures not deemed essential, moving these costs to a third party through a non-binding memorandum of understanding with Epsilon Carbon Pvt. to initiate a pre-feasibility study on an onshore facility.

It appears that investors have severe misgivings. On 5 December 2022, TMC received a written notice from The Nasdaq Stock Market LLC ("NASDAQ") notifying the Company that the average closing price of their common shares had fallen below $1.00 per share, which is the minimum closing bid price required to maintain a listing on the Nasdaq Stock Market.[21] NASDAQ threatened to delist TMC unless they raised their share price above $1.00. This will require either new investors to increase the value of the share price (desirable) or the insiders

[19] Even as late as April 2022, they were talking full lifecycle cost analysis. TMC, *Preliminary Prospectus dated 13 April 2022* at 45, 46, 50.
[20] SEC, *Post-Effective Amendment No. 2 to Form S-1/S-3* (23 November 2022) online: https://www.sec.gov/Archives/edgar/data/1798562/000110465922121882/tm2231259d1_posam.htm; SEC, *Form 10-Q/A (Amendment No. 1) (Mark One) For the quarterly period ended September 30, 2022* online: https://www.sec.gov/Archives/edgar/data/1798562/000110465922118962/tmc-20220930x10qa.htm.
[21] TMC, *SEC Filing Form 8-K*, (5 December 2022) online: https://www.sec.gov/Archives/edgar/data/1798562/000110465922124759/tm2232041d2_8k.htm.

who own the majority of the current shareholdings to "prop up" the value of the shares (undesirable). This is not the only risk TMC faces:

> On 28 October 2021, a shareholder filed a putative class action against us and certain of our executives in federal district court for the Eastern District of New York, styled *Caper v. TMC The Metals Company Inc. F/K/A Sustainable Opportunities Acquisition Corp., Gerard Barron and Scott Leonard*. The complaint alleges that all defendants violated Section 10(b) of the Exchange Act of 1934 and Rule 10b-5 promulgated thereunder, and Messrs. Barron and Leonard violated Section 20(a) of the Exchange Act by making false and misleading statements and failing to disclose information about our operations and prospects. On 15 November 2021, a second complaint containing substantially the same allegations was filed, captioned *Tran v. TMC the Metals Company, Inc.* These cases have been consolidated.[22]

Nauru and the ISA could be incentivized to push through incomplete exploitation regulations to ensure that TMC has the cash to continue its activities. These changes have significant ramifications for mineral valuation, environmental and social protection and regulatory capture.

8.1.2 Developing a Mineral Asset Valuation Code to Assist Contractors and Sponsoring States with the Sustainable Exploitation of Minerals

As mentioned in Chapter 6, ISA Member States' commitments to transitioning to a sustainable economy require a consideration of the impact of seabed mining on the climate, environment and biodiversity.[23] Also noted is the postulation that a holistic financial system based on true environmental costs and natural wealth is needed to capture ecosystem resilience's impacts and potential financial benefits. The payment regime should reflect all costs and risks associated with mining in the Area.[24]

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[22] TMC, *Form 10-K Annual Report* (31 December 2022) at 94. No update on this lawsuit is available as of 3 January 2023.

[23] T Thiele, HP Damian & P Singh*, A Comprehensive Approach to the Payment Mechanism for Deep Seabed Mining*, IASS Policy Brief 2021.

[24] Daniel Wilde, "An Evaluation of the Payment Regime for Deep Seabed Polymetallic Nodule Mining in the Area" R Sharma [ed] *Perspectives on Deep-Sea Mining* (Springer, 2022) at 531; *Responsibilities and Obligations of States Sponsoring Persons and Entities with Respect to Activities in the Area* (Advisory Opinion) [2011] ITLOS Case No 17; Edwin Egede, Mati Pal & Eden Charles, *Study on Issues Related to the Operationalization of the Enterprise in particular on the Legal, Technical and Financial Implications for the International Seabed Authority and for States Parties to the United Nations Convention on the Law of the Sea* (2019) at 18; *Draft Regulations on Exploitation of Mineral Resources in the Area* (2019), ISBA/25/C/WP1.

A sustainable seabed mining valuation code would assist financial institutions in valuing projects correctly and adhering to sustainable development principles. As developed in Chapter 6, incorporating environmental performance factors and costs, such as the Capital Asset Pricing Model for Nature or a social cost of carbon, into a risk analysis will help ensure that projects are categorized and risked accordingly. TMC, for example, asserts that:

> The social impacts of the off-shore operation are expected to be positive. The CCZ is uninhabited by people, and there are no landowners associated with the NORI Area D nodule project. No significant commercial fishing is carried out in the area. The Project will provide a source of revenue to the sponsor country, Nauru, and the ISA.[25]

DOSI, an environmental NGO, disagrees. First, they argue that there is no social license for deep-sea mining.[26] Second, there is a possibility for the introduction of new microbes into the human immune system, negatively impacting health. The 'environmental baselines' are not, in fact, a baseline. I showed in the previous section that TMC clarified that their environmental baselines are financial only and only to the extent that they have cash flows to the third quarter of 2023. Social licence, now associated with mining on land, did not exist when UNCLOS was negotiated and remains problematic for seabed mining.[27]

This social licence has been an issue with the world's first planned seabed mining operation, the Solwara 1 project off Papua New Guinea, contracted by Nautilus Minerals Inc.[28] Solwara 1 has not commenced, and damage has not occurred. But the social license to operate, or perhaps the Sustainable Development License to operate, as introduced in Chapter 6, could

[25] AMC, *Initial Assessment of the NORI Property, supra note 16* at viii.
[26] DOSI, *Letter to Michael Lodge, ISA*, (18 November 2021) online: https://static1.squarespace.com/static/611bf5e1fae42046801656c0/t/6220ff81b1b3701e8f8068ea/1646329743006/NORI+Collector+Test+EIS+Public+Comments_Final_Reduced+File+Size.pdf.
[27] Colin Filer & Jennifer Gabriel, "How could Nautilus Minerals get a social licence to operate the world's first deep sea mine?" (2018) 95:C Marine Policy 394; Jeff Ardron, *Good governance of deep-seabed mining: transparency and the monitoring of environmental harm* (Ph.D. Thesis, University of Southampton, 2020) [unpublished] at 3.
[28] DeepGreen purchased the bankrupt Nautilus's Tongan operations, and then TMC purchased DeepGreen.

ensure that governance, transparency, and public participation processes are followed, such that the ecosystem approach and the internationalization of social costs are followed.

8.2 Value of Valuation Code to Seabed Mining Parties

8.2.1 The Value to the ISA

The ISA can also benefit from a seabed mining valuation code. The ISA could learn from professional standard-setting bodies to develop its *Draft Standards and Guidelines* procedures, particularly concerning the involvement of all relevant experts and stakeholders. The ISA should also consider contracting out the standard-developing process management to professional standard-setting organizations, such as CIMVAL and the ISSB. This process of outsourcing would not in any way reduce the ISA's ownership of the process and content. It would ensure that procedural aspects (such as convening working groups, remote working technology, and public consultations) are managed by a recognized expert in this field while recognizing capacity challenges within the ISA. CIMVAL and the ISSB have years of experience crafting frameworks and codes using a multi-stakeholder approach and input. The ISSB is part of the international accounting standards body, and thus, it can align environmental performance with other financial requirements. The ISA's Reporting Standard already follows CRIRSCO. The template has been created. The ISA Reporting Standard could easily include valuation and environmental information and require public disclosures. Currently, there is no internationally agreed framework for the economic valuation of ecosystem services. The ISA could truly become an environmental leader by championing the creation of a systematic valuation code that standardizes values for these ecosystem services.

8.2.2 Application to the Enterprise

The Enterprise could be the biggest "winner" in a seabed mining valuation code. This would, in turn, help developing countries. As introduced in Chapter 3, the unique position of the developing countries would have to weigh against the need to secure an adequate return for those (whether individual governments or other entities) supplying the initial capital.[29] This needs to be further discussed in the context of the start-up Enterprise and its calculations in a joint venture agreement. The African Group, quite correctly, does not consider that the *Draft Exploitation Regulations* or the payment regime of the ISA can be finalized without independent input from the Enterprise.[30]

The goal of sound commercial principles and cost-effectiveness concerning the operations of the Enterprise should mandate that the Enterprise generate enough revenue to finance its running cost and run its operations efficiently without the need to be subsidized by Member States or the ISA. Commercial viability should mean that the Enterprise should have equal and fair access to a market for the resources and the prospects for that market without the ISA unduly influencing pricing or valuations.[31]

The Enterprise must also account for environmental valuations in its financial statements as a partner.[32] The Enterprise will thus require a technical valuation similar to TMC's technical valuations under 43-101 and Regulation S-K. These are expensive studies to complete. For

[29] Edwin Egede, "Strategic roadmap for the development of deep seabed mining regulations in the framework of the African blue economy" (2020); Edwin Egede, Mati Pal & Eden Charles, *supra* note 24; Wilde, *supra* note 24 at 529.
[30] Peoples Republic of Algeria, *Request for consideration by the Council of the African Groups proposal for the overutilization of the Enterprise*, Doc No. MPANY/N04/MR18 (July 2018) at 7.
[31] *Issues relating to the operation of the Enterprise, in particular the legal, technical and financial implications for the International Seabed Authority and for States parties to the United Nations Convention on the Law of the Sea,* ISBA/25/C/26 (2019) at 6.
[32] Alec Crawford, *The Mining Policy Framework: Assessing the implementation readiness of member states of the Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development* Synthesis Report (October 2015) at 2.

example, AMC Consulting drafted the NORI Technical Report while Allseas conducted the feasibility studies. With limited resources, the Enterprise would also need to fund these ventures. Some ecosystem services are very difficult to quantify in monetary terms, and some non-anthropocentric concepts of intrinsic values for nature. This makes valuing such items as biodiversity, genetic material, intergenerational equity, and intragenerational equity difficult but all the more important.

A technical assessment should be required to include social factors. For example, in preparing their applications for a mining permit, mining entities must consult with communities and other stakeholders at all stages of the assessment and planning process and document the nature and results of their engagement programme in the permit application. The permit applications, when applicable, address Indigenous peoples, cultural heritage, community safety and security issues.[33]

Yet, the limited work conducted by the ISA to date on social valuations makes an Enterprise led social impact assessment difficult. Without transparency, investors may be reluctant to fund such a venture. Thus, the possibility of devising the financial payment system under the mining code in such a manner as to garner funds from contractors that could be utilized for operationalizing the Enterprise should be explored. The terms and conditions upon which equity participation may be obtained must be further elaborated. To date, no efforts appear to have been made in this regard.[34]

Finally, the Enterprise's permit application should include acceptable plans for the eventual closure of the mine and the provision of adequate financial assurance to cover the closure costs and any ongoing monitoring similar to the requirements in CIMVAL and

[33] IGF, *supra* note 8 at 8.
[34] Algeria, *supra* note 30 at 6.

VALMIN.[35] Since no closure standards exist for any contractor, this would not be currently possible.

As such, the Enterprise would need to obtain and fund all requirements for data collection. This would indicate that the Enterprise will be funded solely by the pre-feasibility studies (which may not yet exist) from the reserved areas. If the Enterprise or developing States cannot obtain technology, the ISA may request all or any of the contractors and their Sponsoring State(s) to cooperate with it to facilitate such technology acquisition in good faith.[36] Technology would include data collection, vessels, information technology, patents and perhaps even the data itself. Again, this could indicate that a joint venture partner would be responsible for conducting and financing the work. The Enterprise then would only need to be a shell company.

Thus, the potential for corporate capture could be as real as regulatory capture. The mandate of joint ventures and the potential ownership of 50% of a mining operation by the ISA is problematic and may lead to corporate capture for several reasons. If the Enterprise is a mere shell company with only the director-general in employment, then the work of TMC (which owns DeepGreen) could supersede any goals of the Enterprise. The joint venture would be an easy and cheap way for TMC, Poland or some other entity to access the reserved area. The joint venture agreement may not be integrated with other financial arrangements. The autonomy of the Enterprise means that it should be free to make effective commercial decisions without political influence.[37] The organization would need an appropriate structure consisting of several organs composed of government representatives and its secretariat.

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[35] Edwin Egede, *Africa and the deep seabed regime politics and international law of the common heritage of mankind* (Berlin: Berlin, 2011) at 11.
[36] *Ibid* at 17.
[37] Klass Willaert, "Effective Protection of the Marine Environment and Equitable Benefit Sharing in the Area: Empty Promises or Feasible Goals?" (2020) 51:2 Ocean development and international law 175.

The ISA must conduct additional work to ensure the Enterprise can collect the necessary data. Moreover, profit distribution would also require careful regulation. As the ISA notes, while the financial terms of contracts and the Enterprise's financing are logically distinct and separate issues, it has always been understood that there is an inseparable linkage between the two issues.[38] A sustainable seabed valuation code would help, as it would standardize the methods and methodologies needed for financial, environmental and social data collection. While some basic information on the exploration contract is available to the ISA, it is not comparable to the volume and quality of the information provided to securities regulators (and the public) by companies such as TMC. This is problematic given the Enterprise's current financing, funding, and lack of expertise.

8.2.3 TMC Examples

TMC claims that "it is time to look to the ocean, where vast fields of ocean nodules sit unattached on the deep seafloor, containing most of the battery metals we will ever need."[39] They claim to have zero emissions and no environmental impact. They have partnered with mining and commodities trader Glencore PLC, a company under investigation for alleged corruption in the Democratic Republic of Congo.[40] Public participation in State decision-making is an important obligation in environmental and human rights law, all of which apply to the Government of Nauru (and other Sponsoring States at the ISA). Aligning public disclosure requirements from the ISSB and GRI frameworks will help promote a transparent process and put all contractors on a level playing field. TMC claims its report is based on the Task Force for Climate-Related Disclosures, the Taskforce on Nature-Related Financial Disclosures, the GRI

[38] ISA, *supra* note 31 at 200.
[39] DeepGreen, "Our Story" online: https://deep.green/journey/.
[40] Cecilia Jamasine, "Glencore hit by another probe over Congo dealings" (22 June 2020) online: https://www.mining.com/glencore-hit-by-yet-another-probe-over-congo-dealings/.

and the SASB standards for the minerals and mining sector. This should add significant additional disclosure as the SEC only proposes adding additional climate and environmental-related disclosure requirements to its Regulation S-K filings.[41]

The SEC disclosure rules and land-based mining requirements are more robust than current ISA rules. By requiring TMC to revise its disclosure numerous times, the SEC has brought to light many deficiencies in valuation that were either missed or overlooked by the ISA. TMC always agreed with the SEC's concerns and added additional disclosure.[42]

8.2.4 The value of the valuation code to the LTF

Not only does the LTF help inform the valuation code, but the valuation code helps develop the LTF. The LTF is premised on fundamental uncertainty.[43] The lack of knowledge on the elements contained in nodules and other seabed minerals is so uncertain as to be unstable. Moreover, the complexity of actors within seabed mining and the tangled web of relationships builds upon the LTF's conceptual interpretation. Private and public entities each generate an IOU, which can be the entire basis of a contractor's Environmental Performance Guarantee, or the lack of an Insurance Standard may prevent the protection they were designed to do.

Regulations such as the Draft Exploitation Regulations are often several pages, while contracts, especially in financial deals such as financing and lending, are often several hundred pages long. This can hinder development in regions where the local lawyers cannot understand the complexities of modern finance. So, while ISA is composed of multiple countries,

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[41] SEC, "SEC Proposes Rules to Enhance and Standardize Climate-Related Disclosures for Investors" (21 March 2022) online: https://www.sec.gov/news/press-release/2022-46.
[42] SEC, *Letter to SOAC re Amendment No. 2 Registration Statement on Form S-4 filed 22 June 2021* (9 July 2021); TMC, *Q3 Corporate Update Exhibit 99.1* (14 November 2022) online: https://www.sec.gov/Archives/edgar/data/1798562/000110465922118991/tm2223927d2_ex99-1.htm; NY Times, "Battle Over Deep-Sea Mining Takes on New Urgency as Trial Run Winds Down" (3 November 2022) online: https://www.nytimes.com/2022/11/03/world/deep-sea-mining.html.
[43] Pistor, K. (2013). A legal theory of finance. Journal of Comparative Economics, 41(2), 315

emphasizing developing States, the legal realities of financial contracts will ensure that developed States with mining financial and legal individuals will continue to be at the Apex of financial transactions.

8.3 Revising land-based codes

> Please revise your disclosure to discuss how the nature, amount of consideration, transaction structure, and other material terms were determined, including how the parties agreed to and the basis underpinning the pre-transaction equity value ascribed to DeepGreen of $2.25 billion.[44]

The value of TMC on 30 December 2022 had dropped to $205 million.[45] While company values rise and fall, this drop represented an over 90% fall in the value of the shares. As illustrated in Chapter 4, TMC's assumptions are related to the value of the ore. There appear to be flaws with current securities requirements and land-based mineral asset valuation codes, especially in the environmental and social disclosures. Revising terrestrial codes to include the IGF Mining Policy Framework, the Towards Sustainable Mining initiative, and other principles of sustainable development could elevate both industries to have mineral valuations consistent with environmental protections. Enacting such a code would align with the necessity under UNCLOS to not unduly cause harm or give any uncompetitive advantage to either land-based or seabed mining. It would necessitate frameworks such as CIMVAL, VALMIN, SAMVAL and the SME to incorporate better and internalize environmental costs, as mandated under Rio *Principle 16*.

It would necessitate updates to the TSM and IGF Mining Policy Framework. It would assist these bodies in promoting a new way of viewing social developments and equitable

[44] SOAC, *Letter to SEC re Registration Statement on Form S-4 filed April 8, 2021* (26 May 2021) online: https://www.sec.gov/Archives/edgar/data/1798562/000000000021010406/filename1.pdf.
[45] Google Finance, "TMC" online: https://www.google.com/finance/quote/TMC:NASDAQ?authuser=0&window=1Y.

sharing. And finally, a sustainable seabed mining code will help align the myriad of other issues, such as a Seabed Sustainability Fund, an Environmental Compensation Fund, and a Guarantee. It would help value some of the risks found in an impact assessment. A framework for valuing the minerals, the most important part of a mining operation, will help value royalties and other financial requirements. I argue that a sustainable seabed mining valuation code will actually help all contractors, not hinder their efforts.

8.4 Conclusion

A valuation code would not ultimately answer critical questions of a moratorium or the need for critical minerals found on the seabed. Addressing financial information more accurately would determine whether these projects are truly profitable, not only from a financial perspective but also from a biodiversity, human capital, and planetary perspective. We have seen an ebbing of profit from the MIT models when a few minor factors, such as the amount of ore or different tax rates, are factored into the analysis. If environmental, social, and other risk factors are included, the profit may be reduced so that these projects do not make sense, and financial institutions may deem them too risky to finance or insure. This will cause a *de facto* moratorium if the political will is not present to create such a moratorium. As TMC stated in March of 2023:

> The realization of the Company's assets and attainment of profitable operations is dependent upon many factors including, among other things: financing being arranged by the Company to continue operations, development of a nodule collection system for the recovery of polymetallic nodules from the seafloor as well as development of processing technology for the treatment of polymetallic nodules, the establishment of mineable reserves, the commercial and technical feasibility of seafloor polymetallic nodule collection and processing, metal prices, and regulatory approvals and environmental permitting for commercial operations. The outcome of these matters cannot presently be determined because they are contingent on future events and may not be fully under the Company's control.[46]

[46] TMC, *Quarterly Report Form 10-Q* (31 March 2023) online: https://www.sec.gov/Archives/edgar/data/1798562/000110465923059123/tmc-20230331x10q.htm at 9.

While not under TMC's control, it is certainly controllable by the ISA, Sponsoring States, and all stakeholders.

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