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Compensable Damage of Deep Seabed Mining

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Abstract:

The current legal framework for deep seabed mining does not define compensable damage and contains only partially developed mechanisms to consider compensable damage in a practical setting. This is problematic considering the protection and preservation of the Area, its resources, and the marine environment, as well as private interests, potentially affected by the deep seabed mining missions. This research paper takes up an ambitious task to address the gaps in the comprehension and knowledge regarding compensable damage, by researching the preceding legal research and delving into the legal framework of the deep seabed mining. The research attempts to answer the question of determination of compensable damage under that framework, and to compile and define the elements and mechanisms necessary to determine compensable damage, including the liability regime, identification of the potential subjects and claimants of damage, and the mechanisms of thresholds within the United Nations Convention on the Law Of the Sea and other relevant instruments.

Key words: DSM, deep seabed mining, deep-sea mining, United Nations Convention on the Law Of the Sea, UNCLOS, Mining Code, exploitation, oceans, International Seabed Authority, compensable damage, thresholds, liability, sponsoring State, draft exploitation regulations.

The research does not contain personal data other than those of the author.

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Tiivistelmä:

Tällä hetkellä kansainvälisen alueen syvän meren louhintaa koskeva oikeudellinen kehys ei riittävästi määrittele louhinnasta syntyvien vahinkojen korvattavuutta ja muutenkin sisältää vain osittain kehitettyjä menetelmiä korvattavien vahinkojen määrittelyyn oikeuskäytännössä. Tästä seuraa runsaasti ongelmia, ottaen muun muassa huomioon ”Alueeksi” kutsutun kansainvälisen merenpohjan, siitä saatavien resurssien ja meren luontoympäristön suojelun tavoitteet, sekä yksityisten intressien turvaamisen, jotka saattavat kukin joutua koetukselle louhinnan seurauksena. Kyseessä oleva maisteritutkielma ottaa tehtäväkseen kunnianhimoisen tavoitteen pohtia ja tutkia oikeuden aukkokohtia liittyen korvattaviin vahinkoihin sekä niiden ymmärtämiseen. Tutkielma keskittyy aiempaan tutkimukseen ja syventyy syvän meren louhinnan kansainvälisoikeudelliseen kehukseen. Tutkielma pyrkii vastaamaan kysymykseen, joka liittyy korvattavien vahinkojen määrittelyyn kyseessä olevan oikeudellisen kehyyksen alla. Tutkielma pyrkii myös kokoamaan ja määrittelemään elementit ja mekanismit, joiden avulla korvattavia vahinkoja voidaan objektiivisesti tunnistaa, mikä edellyttää vastuusasioiden, mahdollisten vahinkojen kohteiden ja kantajien, sekä vahinkojen raja-arvojen tunnistamista. Vastauksia pyritään löytämään muun muassa kansainvälisen merioikeusyleissopimuksen sekä muiden relevanttien instrumenttien sisällön pohjalta.

Avainsanat: syvän meren louhinta, kansainvälinen merioikeusyleissopimus, UNCLOS, Yhdistyneet Kansakunnat, YK, valtameret, meret, kansainvälinen merenpohjajärjestö, korvattavat vahingot, raja-arvot, vastuu, sponsorivaltio.

Tutkielma sisältää vain tekijän henkilötietoja.

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RESOURCES

- Arnaud-Haond, S. (2020). Mind the Gap between Biological Samples and Marine Genetic Resources in Areas beyond National Jurisdiction: Lessons from Land. Chapter 2 from Heidar, T. (ed.) (2020). *New Knowledge and Changing Circumstances in the Law of the Sea*. BRILL, Leiden, 2020.
https://doi.org/10.1163/9789004437753_004
- Baslar, K. (2016). “Common-Heritage-Mankind” Contribution to *Encyclopedia of the Barents Region*, vol. 1 A–M and vol. 2 N–Y, 2016.
- Bourrel, M., Thiele, T., Currie, D. (2018). The common of heritage of mankind as a means to assess and advance equity in deep sea mining. *Marine Policy*, vol. 95, 2018. Pages 311-316. <https://doi.org/10.1016/j.marpol.2016.07.017>
- Britannica, T. Editors of Encyclopaedia (2023) *Benjamin Nathan Cardozo*. Encyclopedia Britannica 2023. Reference from 30 October 2023.
<https://www.britannica.com/biography/Benjamin-Nathan-Cardozo>.
- Carrillo, C. (2023). “The Advisory Jurisdiction of the ITLOS: From Uncertainties to Opportunities for Ocean Governance.” In Platjouw, F. & Pozdnakova, A. (eds.), *The Environmental Rule of Law for Oceans: Designing Legal Solutions*. Cambridge: Cambridge University Press, 2023, p. 236-251.
<https://doi.org/10.1017/9781009253741>
- Cittadino, F. (2019). Science novit curia? Damage evaluation methods and the role of experts in the Costa Rica v Nicaragua case., Topic: The ICJ and the Compensation for Environmental Damage in Nicaragua/Costa Rica Case: Does the Application of Equitable Principles Offset Independent Technical Expertise? QIL, Zoom-in, vol. 57. *Questions of International Law Journal (QILJ)* 2019, p. 35-53. <http://www.qil-qdi.org/scientia-novit-curia-damage-evaluation-methods-and-the-role-of-experts-in-the-costa-rica-v-nicaragua-case/>

- Client Earth (2023). *Legal Analysis Request for an Advisory Opinion from the International Tribunal for the Law of the Sea*. Written Statement of Client Earth, Case no. 31, 2023. Reference from 21 January 2024.
<https://www.clientearth.org/latest/documents/request-for-an-advisory-opinion-from-the-international-tribunal-for-the-law-of-the-sea/>
- Craik, N. (2018). *Determining the Standard for Liability for Environmental Harm from Deep Seabed Mining Activities*. Liability Issues for Deep Seabed Mining Series, Paper No. 2. Centre for International Governance Innovation (CIGI) 2018.
<https://www.cigionline.org/publications/determining-standard-liability-environmental-harm-deep-seabed-mining-activities/>
- Currie, D. (2020). Seabed Mining: Legal Risks, Responsibilities and Liabilities for Sponsoring States. *Deep Sea Conservation Coalition (DSCC) 2020*.
https://www.savethehighseas.org/wp-content/uploads/2020/10/Seabed-Mining-Liability-Factsheet_DSCC_July2020.pdf
- Cuyvers, L., Berry, W., Gjerde, K., Thiele, T. and Wilhem, C. (2018). *Deep seabed mining: a rising environmental challenge*. Gland, Switzerland: IUCN and Gallifrey Foundation 2018. <https://doi.org/10.2305/IUCN.CH.2018.16.en>
- Davenport, T. (2019). *Responsibility and Liability for Damage Arising Out of Activities in the Area: Potential Claimants and Possible Fora*. Liability Issues for Deep Seabed Mining Series, Paper No. 5. Centre for International Governance Innovation (CIGI) 2019. <https://www.cigionline.org/publications/responsibility-and-liability-damage-arising-out-activities-area-potential-claimants/>
- de Jonge, D.S.W., Stratmann, T., Lins, L., Vanreusel, A., Purser, A., Marcon, Y., Rodrigues, C.F., Ravara, A., Esquete, P., Cunha, M.R., Simon-Lledó, E., van Breugel, P., Sweetman, A.K., Soetaert, K., van Oevelen, D. (2020). Abyssal food-web model indicates faunal carbon flow recovery and impaired microbial loop 26 years after a sediment disturbance experiment. *Progress in Oceanography*, vol. 189, art. 102446, 2020. <https://doi.org/10.1016/j.pocean.2020.102446>

- Dingwall, J. (2021). *International Law and Corporate Actors in Deep Seabed Mining*. Series: Oxford monographs in international law. Oxford University Press: Oxford 2021. doi: 10.1093/oso/9780192898265.001.0001
- Dobinson, I., & Johns, F. (2017). Legal research as qualitative research. Chapter 1. In McConville, M., & Chui, W.H. (eds.) (2017). *Research methods for law* 2nd edition, Edinburgh University Press, 2017, p. 18-47.
<https://www.jstor.org/stable/10.3366/j.ctt1g0b16n>
- Drazen, J., Smith, C., Gjerde, K., Haddock, S., Carter, G., Choy, A., Clark, M., Dutrieux, P., Goetze, E., Hauton, C., Hatta, M., Koslow, J., Leitner, A., Pacini, A., Perelman, J., Peacock, T., Sutton, T., Watling, L., & Yamamoto, H. (2020). Midwater ecosystems must be considered when evaluating environmental risks of deep-sea mining. *Proceedings of the National Academy of Sciences*, vol. 117, no. 30, 2020. <https://doi.org/10.1073/pnas.2011914117>
- DSCC 2022. *World Leaders Call For Urgent Action To Halt The Emerging Deep-Sea Mining Industry*. Press Release. Published on 28 June 2022. Deep Sea Conservation Coalition (DSCC) 2022. Reference from 11 January 2024.
<https://savethehighseas.org/2022/06/27/world-leaders-call-for-urgent-action-to-halt-the-emerging-deep-sea-mining-industry/>
- Durden, J., Lallier, L., Murphy, K., Jaeckel, A., Gjerde, K., & Jones, D. (2018). Environmental Impact Assessment process for deep-sea mining in ‘the Area’. *Marine Policy*, vol. 87, 2018, p. 194-202.
<https://doi.org/10.1016/j.marpol.2017.10.013>.
- Durden, J., Murphy, K., Jaeckel, A., Van Dover, C., Christiansen, S., Gjerde, K., Ortega, A., & Jones, D. (2017). A procedural framework for robust environmental management of deep-sea mining projects using a conceptual model. *Marine Policy*, vol. 84, 2017, p. 193-201. <https://doi.org/10.1016/j.marpol.2017.07.002>.

Ecorys Nederland BV (2014). *Study to investigate the state of knowledge of deep-sea mining*. Final Report under FWC MARE/2012/06 - SC E1/2013/04. Client: European Commission - DG Maritime Affairs and Fisheries FGP96656 JG/OV. Consortium Lead Partner: ECORYS Nederland BV 2014.
https://meriteollisuus.teknologiateollisuus.fi/sites/meriteollisuus/files/file_attachments/Study%20to%20investigate%20the%20state%20of%20knowledge%20of%20deep%20sea%20mining.pdf

European Commission (EC) website, regarding:

“Food, Farming, Fisheries > Oceans and Fisheries > Home > Sustainable oceans > International ocean governance > Protecting the ocean, time for action”

Reference from 29 July 2023.

https://oceans-and-fisheries.ec.europa.eu/ocean/international-ocean-governance/protecting-ocean-time-action_en

Feichtner, I. (2020). Contractor liability for environmental damage resulting from deep seabed mining activities in the area. *Marine Policy*, vol. 114, art. 103502, 2020.
<https://doi.org/10.1016/j.marpol.2019.04.006>

Fitzmaurice, M. (2023). A Few Reflections on State Responsibility or Liability for Environmental Harm. *EJIL: Talk! Blog of the European Journal of International Law* 2023. Reference from 02 November 2023. <https://www.ejiltalk.org/a-few-reflections-on-state-responsibility-or-liability-for-environmental-harm/>

Garcia-Reville, M.G. (2017). International Tribunal for the Law of the Sea (ITLOS). *Yearbook of International Environmental Law*, vol. 31, issue 1, 2020, p. 428-431. Oxford University Press Journals Current; Social Science Premium Collection.
<https://doi.org/10.1093/yiel/yvab050>

GBA & WEF (2019). *A Vision for a Sustainable Battery Value Chain in 2030: Unlocking the Full Potential to Power Sustainable Development and Climate Change Mitigation*. An Insight Report. Global Battery Alliance & World Economic Forum, 2019. Reference from 21 January 2024.

<https://www.weforum.org/publications/a-vision-for-a-sustainable-battery-value-chain-in-2030>

Goldberg, J.C.P, & Zipursky, B.C. (2016). The Strict Liability in Fault and the Fault in Strict Liability. *Fordham Law Review*, vol. 85, no. 2, 2016.

<https://ir.lawnet.fordham.edu/flr/vol85/iss2/16>

Haalboom, S., de Stigter, H.C., Mohn, C., Vandorpe, T., Smit, M., de Jonge, L., Reichart, G-J. (2023). Monitoring of a sediment plume produced by a deep-seabed mining test in shallow water, Málaga Bight, Alboran Sea (southwestern Mediterranean Sea). *Marine Geology*, vol. 456, art. 106971, 2023.

<https://doi.org/10.1016/j.margeo.2022.106971>

Haeckel, M., Vink, A., Janssen, F., & Kasten, S. (2020). Environmental Impacts of Deep Seabed Mining. Chapter 16 in Heidar, T. (ed.) (2020). *New Knowledge and Changing Circumstances in the Law of the Sea*. BRILL, Leiden, 2020.

https://doi.org/10.1163/9789004437753_018

Handl, G. (2019). Marine Environmental Damage: The Compensability of Ecosystem Service Loss in International Law. *The International Journal of Marine and Coastal Law*, vol. 34, issue 4, 2019, p. 602-641.

<https://doi.org/10.1163/15718085-23441025>

Harden-Davies, H. (2017). Deep-sea genetic resources: New frontiers for science and stewardship in areas beyond national jurisdiction. *Deep Sea Research Part II: Topical Studies in Oceanography*, vol. 137, 2017, p. 504-513.

<https://doi.org/10.1016/j.dsr2.2016.05.005>

- Hallgren, A. & Hansson, A. (2021). Conflicting Narratives of Deep Sea Mining. *MDPI Journal on Sustainability*, vol. 13, no. 9, art. 5261, 2021.
<https://doi.org/10.3390/su13095261>
- Henriksen, T. (2022). Mapping Key Past and Current Debate on Areas beyond National Jurisdiction, chapter 4 in De Lucia, V., Oude Elferink, A., & Ngoc Nguyen, L. (eds.) (2022). *International Law and Marine Areas Beyond National Jurisdiction : Reflections on Justice, Space, Knowledge and Power*. BRILL, Leiden, 2022.
https://doi.org/10.1163/9789004506367_005
- Herman, A. (2016). *Assessing the Ocean Governance Frameworks Underpinning Deep Sea Minerals Development in the Cook Islands*. UN-Nippon Foundation Fellowship 2015-2016.
https://www.un.org/oceancapacity/sites/www.un.org.oceancapacity/files/herman_alexandrya_thesis_final.pdf
- Hinrichs Oyarce, X. (2018). Sponsoring States in the Area: Obligations, liability and the role of developing States. *Marine Policy*, vol. 95, p. 317–323.
<https://doi.org/10.1016/j.marpol.2016.06.002>.
- Hitchin, B., Smith, S., Kröger, K., Jones, DOB., Jaeckel, A., Mestre, NC., Ardron, J., Escobar, E., van der Grient, J., Amaro, T. (2023). Thresholds in deep-seabed mining: A primer for their development. *Marine Policy*, vol. 149, art. 1055505, 2023. <https://doi.org/10.1016/j.marpol.2023.105505>
- Hutchinson, T., & Duncan, N. (2012). Defining and describing what we do: Doctrinal legal research. *Deakin law review*, vol. 17, no. 1, 2012, p. 83-119.
<https://doi.org/10.21153/dlr2012vol17no1art70>
- House of Lords (2022). *UNCLOS: the law of the sea in the 21st century*. HL Paper 159, 2nd Report of Session 2021-2022. House of Lords, International Relations and Defence Committee.
<https://committees.parliament.uk/publications/9005/documents/159002/default/>

Howard, P., Parker, G., Jenner, N., & Holland, T. (2020). *An assessment of the risks and impacts of seabed mining on marine ecosystems*. Flora & Fauna International, 2020. Reference from 21 January 2024. www.fauna-flora.org

International Tribunal for the Law of the Sea (ITLOS) Website, regarding:

“Home > The Tribunal > Chambers”

“Home > The Tribunal > Relationship with the United Nations”

“Home > Latest News”

“Main > Jurisdiction > Competence > (c) Jurisdiction of the Seabed Disputes Chamber”

Reference from 04 August 2023.

<https://www.itlos.org/en/main/the-tribunal/chambers/>

<https://www.itlos.org/en/main/the-tribunal/relationship-with-the-united-nations>

<https://www.itlos.org/en/main/latest-news/>

<https://www.itlos.org/en/main/jurisdiction/competence/>

International Seabed Authority (ISA) website, regarding:

“Main > About the Authority > About ISA”

“Main > Our Work > Exploration Contracts”

“Main > About the Authority > Organs > the Finance Committee”

“Main > Our Work > The Mining Code > Draft standards and guidelines”

Reference from 29 July 2023.

<https://www.isa.org.jm/about-isa/>

<https://www.isa.org.jm/exploration-contracts/>

<https://www.isa.org.jm/organs/the-finance-committee/>

<https://www.isa.org.jm/the-mining-code/standards-and-guidelines/>

ISA (2015). *Submarine Cables and Deep Seabed Mining*. ISA Technical Study No. 14.

International Seabed Authority, Kingston, 2015.

<https://www.isa.org.jm/publications/technical-study-14-submarine-cables-and-deep-seabed-mining/>

ISA (2019). *Competencies of the International Seabed Authority and the International Maritime Organization in the context of activities in the Area*. ISA Technical Study No. 25. International Seabed Authority, Kingston, 2019.

<https://www.isa.org.jm/documents/20152/>

ISA (2023). *The Rights and Obligations of the International Seabed Authority and the Sponsoring State with Respect to Activities in the Area*. Discussion Paper. International Seabed Authority, Kingston, 2023.

https://www.isa.org.jm/publications/rights_and_obligations/

IUCN Marine videoseminar (2022). *Shining a light on Deep-sea Mining*. Videoseminar, Parts 1 and 2. IUCN MARINE 2022. Published on 3 March 2022.

<https://youtu.be/tlFRw0v5IR0>

Jaeckel, A. (2020). Benefitting from the Common Heritage of Humankind: From Expectation to Reality. *The International Journal of Marine and Coastal Law*, vol. 35, no. 4, p. 660-681. <https://doi.org/10.1163/15718085-BJA10032>

Jaeckel, A. (2020). Strategic environmental planning for deep seabed mining in the area. *Marine Policy*, vol. 114, art. 103432, 2020.

<https://doi.org/10.1016/j.marpol.2019.01.012>.

Jaeckel, A., Harden-Davies, H., Amon, D., van der Grient, J., Hanich, Q., Leeuwen, J., Niner, H., and Seto, K. (2023). Deep seabed mining lacks social legitimacy. *npj Ocean Sustainability* 2, article no. 1. <https://doi.org/10.1038/s44183-023-00009-7>

Jamieson, J.W., Petersen, S., Bach, W. (2016). *Hydrothermalism*. In: Harff, J., Meschede, M., Petersen, S., Thiede, J. (eds.) *Encyclopedia of Marine Geosciences*. Encyclopedia of Earth Sciences Series. Springer, Dordrecht. Reference from 02 November 2023. https://doi.org/10.1007/978-94-007-6238-1_15

Kim, R. (2017). Should deep seabed mining be allowed? *Marine Policy*, vol. 82, 2017, p. 134-137. <https://doi.org/10.1016/j.marpol.2017.05.010>.

- Kindji, K., & Faure, M. (2019). Assessing reparation of environmental damage by the ICJ: A lost opportunity? Topic: The ICJ and the Compensation for Environmental Damage in Nicaragua/Costa Rica Case: Does the Application of Equitable Principles Offset Independent Technical Expertise? *QIL, Zoom-in, vol. 57, Questions of International Law Journal (QILJ)* 2019, p. 5-33. <http://www.qil-qdi.org/assessing-reparation-of-environmental-damage-by-the-icj-a-lost-opportunity/>
- Khalatbari, Y. & Poorhashemi, A. (2019). Environmental Damage: Challenges and opportunities in International Environmental Law. *CIFILE Journal of International Law (CJIL)*, Vol. 1, No. 1, 2019, p. 21-28. <https://doi.org/10.30489/cifj.2019.93906>
- Kung, A., Svobodova, K., Lèbre, E., Valenta, R., Kemp, D., Owen, J.R. (2021). Governing deep sea mining in the face of uncertainty. *Journal of Environmental Management*, vol. 279, art. 111593, 2021. <https://doi.org/10.1016/j.jenvman.2020.111593>
- Lapteva, A., Chernova, A., Khodina, M., Mustafa, T., Mustafina, F., Smolnikova, A. (2020). *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*. ISA Technical Study 32. All-Russian Scientific-Research Institute of Mineral Resources Named after N.M. Fedorovsky (FSBI “VIMS”) 2020. <https://www.isa.org.jm/publications/21773/>
- Lee, ML. (2006). The Interrelation Between the Law of the Sea Convention and Customary International Law. *San Diego International Law Journal*, vol. 7, issue 2, 2006, p. 405-420. <https://digital.sandiego.edu/ilj/vol7/iss2/7>
- Legal Working Group on Liability (LWG) (2018). *Legal Liability for Environmental Harm: Synthesis and Overview*. Liability Issues for Deep Seabed Mining Series, Paper No. 1. Centre for International Governance Innovation (CIGI) 2018. <https://www.cigionline.org/publications/legal-liability-environmental-harm-synthesis-and-overview/>

- Levin, L.A., Mengerink, K., Gjerde, K.M., Rowden, A.A., Dover, C.L.V., Clark, M.R., Ramirez-Llorda, E., Currie, B., Smith, C.R., Sato, K.N., Gallo, N., Sweetman, A.K., Lily, H., Armstrong, C.W., Brider, J. (2016). Defining ‘Serious Harm’ to the Marine Environment in the Context of Deep Seabed Mining. *Marine Policy*, vol. 74, 2016, p. 245-259. <https://doi.org/10.1016/j.marpol.2016.09.032>
- Ma, C., Li, X., Li, Y., Tian, X., Wang, Y., Kim, H., & Serikawa, S. (2021). Visual information processing for deep-sea visual monitoring system. *Cognitive Robotics*, vol. 1, 2021, p. 3-11. <https://doi.org/10.1016/j.cogr.2020.12.002>.
- Mackenzie, R. (2019). *Liability for Environmental Harm from Deep Seabed Mining Activities: Defining Environmental Damage*. Liability Issues for Deep Seabed Mining Series, Paper No. 8. Centre for International Governance Innovation (CIGI) 2019. <https://www.cigionline.org/publications/liability-environmental-harm-deep-seabed-mining-activities-defining-environmental/>
- Managing Impacts of Deep Sea Resource Exploitation (MIDAS). *Plumes from deep-sea mining*, brief. Reference from 02 November 2023. https://www.eu-midas.net/sites/default/files/downloads/Briefs/MIDAS_plumes_brief_lowres.pdf
- Maulida, L.S. (2021). Exploring Compensation Regime For Environmental Damage In Wakashio Oil Spill. *Social Science Research Network (SSRN)*, 2021. <http://dx.doi.org/10.2139/ssrn.3969584>
- McQuaid, K.A. (2020). *Ecological Studies of an Abyssal Nodule Province to Inform the Management of Deep-sea Mining*. University of Plymouth Research Theses, School of Biological and Marine Sciences 2020. <https://dx.doi.org/10.24382/469>
- Merriam-Webster Dictionary. *Threshold*. Merriam-Webster.com Dictionary. Reference from 02 November 2023. <https://www.merriam-webster.com/dictionary/threshold>.

- Miller, K.A., Brigden, K., Santillo, D., Currie, D., Johnston, P., Thompson, K.F. (2021). Challenging the Need for Deep Seabed Mining From the Perspective of Metal Demand, Biodiversity, Ecosystems Services, and Benefit Sharing. *Frontiers in Marine Science*, vol. 8, art. 706161, 2021. <https://doi.org/10.3389/fmars.2021.706161>
- Miller, K.A., Thompson, K.F., Johnston, P., Santillo, D. (2018). An Overview of Seabed Mining Including the Current State of Development, Environmental Impacts, and Knowledge Gaps. *Frontiers in Marine Science*, vol. 4, art. 418, 2018. <https://doi.org/10.3389/fmars.2017.00418>
- National Geographic, website for education. Article on Pollution. Reference from 17 January 2024. <https://education.nationalgeographic.org/resource/pollution/>
- National Oceanic and Atmospheric Administration of the U.S. Department of Commerce (NOAA) Ocean Exploration -website, regarding: “Home > Education > Multimedia Educational Resources > Multimedia Discovery Missions > Lesson 11: Energy from the Oceans”. Reference from 29 July 2023. <https://oceanexplorer.noaa.gov/edu/learning/player/lesson11/111text.htm>
- Ndiaye, T.M. (2010). The Advisory Function of the International Tribunal for the Law of the Sea. *Chinese Journal of International Law*, vol. 9, issue 3, 10/2010. p. 565–587. <https://doi.org/10.1093/chinesejil/jmq022>
- Ngum, F.K., & Rene, N.N. (2021). The International Seabed Authority: Structure, Composition and Competence. *Social Science Research Network (SSRN) Electronic Journal* 2021. <http://dx.doi.org/10.2139/ssrn.3888449>
- Oderkerk, M. (2015). The Need for a Methodological Framework for Comparative Legal Research: Sense and Nonsense of "Methodological Pluralism" in Comparative Law. *Rebels Zeitschrift für ausländisches und internationales Privatrecht*, vol. 79, no. 3, p. 589-623. <https://doi.org/10.1628/003372515X14339403063927>

- Paulus, E. (2021). Shedding Light on Deep-Sea Biodiversity—A Highly Vulnerable Habitat in the Face of Anthropogenic Change. *Frontiers in Marine Science*, vol. 8, art. 667048, 2021. <https://doi.org/10.3389/fmars.2021.667048>
- Pecoraro, A. (2022). Disputes between Deep Seabed Miners and their Sponsoring State: The Role of International Law. *Kluwer Arbitration Blog*. Reference from 21 January 2024. <https://arbitrationblog.kluwerarbitration.com/2022/07/06/disputes-between-deep-seabed-miners-and-their-sponsoring-state-the-role-of-international-law/>
- Planet Tracker. (2023). *The Sky High Cost of Deep Sea Mining*. A report from British non-profit Planet Tracker. Published on 29 June 2023. Reference from 21 January 2024. <https://planet-tracker.org/the-sky-high-cost-of-deep-sea-mining/>
- Poisel, T. (2012). Deep Seabed Mining: Implications of Seabed Disputes Chamber’s Advisory Opinion. *Australian International Law Journal*, Australasian Legal Information Institute (A joint facility of UTS and UNSW Faculties of Law) 2012, p. 213-233. <http://classic.austlii.edu.au/au/journals/AUIntLawJl/2012/11.pdf>
- Proelss, A. & Steenkamp, R.C. (2022). Chapter 13, “Liability Under Part XI UNCLOS (Deep Seabed Mining)”, from the Gailhofer, P., Krebs, D., Proelß, A., Schmalenbach, K., & Verheyen, R. (2022). *Corporate Liability for Transboundary Environmental Harm: An International and Transnational Perspective*. Springer Verlag, 1st edition, 2022. <https://doi.org/10.1007/978-3-031-13264-3>
- Rayfuse, R. (2011). Differentiating the Common: The Responsibilities and Obligations of States Sponsoring Deep Seabed Mining Activities in the Area. *German Yearbook of International Law*, vol. 54, 2011, p. 459-488. <https://lup.lub.lu.se/record/2342916>

- Rocha, A. (2023). *The Advisory Jurisdiction of the ITLOS in the Request Submitted by the Commission of Small Island States*. Sabin Center for Climate Change Law, Columbia Law School, Columbia Climate School, 2023. Reference from 21 January 2024. <https://blogs.law.columbia.edu/climatechange/2023/04/12/the-advisory-jurisdiction-of-the-itlos-in-the-request-submitted-by-the-commission-of-small-island-states/>
- Seas at Risk (2021). *At a crossroads: Europe's role in deep-sea mining*. Seas at Risk, Brussels, 2021. Reference from 21 January 2024. <https://seas-at-risk.org/publications/at-a-crossroads-europes-role-in-deep-sea-mining/>
- Singh, P. A. (2022). The Invocation of the 'Two-Year Rule' at the International Seabed Authority: Legal Consequences and Implications. *The International Journal of Marine and Coastal Law*, vol. 37, issue 3, 2022, p. 375-412. <https://doi.org/10.1163/15718085-bja10098>
- Singh, R., Guzman, M.S., Bose, A. (2017). Anaerobic Oxidation of Ethane, Propane, and Butane by Marine Microbes: A Mini Review. *Frontiers in Microbiology*, vol. 8, 2017. Abstract. <https://doi.org/10.3389/fmicb.2017.02056>
- Spearman, J., Taylor, J., Crossouard, N., Cooper, A., Turnbull, M., Manning, A., Lee, M., and Murton, B. (2020). Measurement and modelling of deep sea sediment plumes and implications for deep sea mining. *Scientific Reports* 10, art. 5075. <https://doi.org/10.1038/s41598-020-61837-y>
- Svendsen, K. (2020). Chapter 25 "Liability and Compensation for Activities in the Area". *The Law of the Seabed*. Brill, Nijhoff. Leiden, The Netherlands 2020. <https://doi.org/10.1163/9789004391567>
- Tanaka, Y. (2013). Obligations and Liability of Sponsoring States Concerning Activities in the Area: Reflections on the ITLOS Advisory Opinion of 1 February 2011. *Netherlands International Law Review*. T.M.C Asser Instituut 2013, p. 205-230. <https://doi.org/10.1017/S0165070X12001167>

- Tanaka, Y. (2021). Temporal Elements in the Valuation of Environmental Damage: Reflections on the Costa Rica v. Nicaragua Compensation Case before the International Court of Justice. *Nordic journal of international law = Acta Scandinavica juris gentium*, no. 3, 2021, p. 257-291.
<https://doi.org/10.1163/15718107-90030001>
- Tilot, V., Willaert, K., Guilloux, B., Chen, W., Mulalap, CY., Gaulme, F., Bambridge, T., Peters, K., and Dahl, A. (2021). Traditional Dimensions of Seabed Resource Management in the Context of Deep Sea Mining in the Pacific: Learning From the Socio-Ecological Interconnectivity Between Island Communities and the Ocean Realm. *Frontiers in Marine Science*, vol. 8, art. 637938, 2021.
<https://doi.org/10.3389/fmars.2021.637938>
- UBA (2023). *Deep-sea mining. The deep sea is one of the last regions on earth largely untouched by humans. The exploitation of mineral resources from deep-sea deposits could become more important due to rising metal prices and greater demand.* Umwelt Bundesamt, the German Environment Agency 2023. Reference from 02 November 2023. <https://www.umweltbundesamt.de/en/print/95314> or <https://www.umweltbundesamt.de/en/topics/water/seas/deep-sea-mining#undefined>
- UBA (2022). *Framework under international law: Part XI of the Convention.* Umwelt Bundesamt, the German Environment Agency, Published on 19 May 2022. “Topics > Water > Seas > Deep-sea mining > Framework under international law: Part XI of the Convention” Reference from 21 January 2024.
<https://www.umweltbundesamt.de/en/topics/water/seas/deep-sea-mining/framework-under-international-law-part-xi-of-the>
- UN Office of Legal Affairs (2018). *United Nations Convention on the Law of the Sea of 10 December 1982 Overview and full text.* Division for Ocean Affairs and the Law of the Sea, Office of Legal Affairs, United Nations, 2018. Reference from 21 July 2023.
https://www.un.org/depts/los/convention_agreements/convention_overview_convention.htm

Voigt, C. (2021). International Environmental Responsibility and Liability. *Social Science Research Network (SSRN) Electronic Journal* 2021.

<http://dx.doi.org/10.2139/ssrn.3791419>

Washburn, T., Turner, P., Durden, J., Jones, D., Weaver, P., & Van Dover, C. (2019). Ecological risk assessment for deep-sea mining. *Ocean & Coastal Management*, vol. 176, 2019, p. 24-39. <https://doi.org/10.1016/j.ocecoaman.2019.04.014>

Weiler, J. H. H., & Paulus, A. L. (1997). The structure of change in international law or is there hierarchy of norms in international law? *European Journal of International Law*, vol. 8, no. 4, 1997, p. 545-565.

<https://doi.org/10.1093/oxfordjournals.ejil.a015606>

Wilen, CA., Koike, ST., Ploeg, AT., Tjosvold, SA., Bethke, JA., Mathews DM., Stapleton JJ. Revised continuously. *UC IPM Pest Management Guidelines: Floriculture and Ornamental Nurseries*. UC ANR Publication 3392. Davis, CA. Reference from 21 January 2024. <https://ipm.ucanr.edu/agriculture/floriculture-and-ornamental-nurseries/establishing-treatment-thresholds/>

Willaert, K. (2021). *Regulating Deep Sea Mining - A Myriad of Legal Frameworks*, 1st ed. SpringerBriefs in Law. Springer Nature Switzerland AG 2021.

<https://doi.org/10.1007/978-3-030-82834-9>

Willaert, K. (2021). The Enterprise: State of affairs, challenges and way forward. *Marine Policy*, vol. 131, art. 104590, 2021. <https://doi.org/10.1016/j.marpol.2021.104590>.

Willaert, K. (2020). Crafting the perfect deep sea mining legislation: A patchwork of national laws. *Marine Policy*, vol. 119, art. 104055, 2020.

<https://doi.org/10.1016/j.marpol.2020.104055>

Willaert, K. (2019). *Assessment of the ISA Draft Exploitation Regulations*. WWF.

<https://lib.ugent.be/catalog/pug01:8607135>

WWF: No Deep Seabed Mining. World Wide Fund for Nature (WWF) website. Reference from 21 January 2024.

https://wwf.panda.org/discover/our_focus/oceans_practice/no_deep_seabed_mining/

Xu, X., Li, M., Xue, G. (2023). Revisiting the ‘Responsibility to Ensure’: Two-Line Standards of the Sponsoring State’s National Legislation on Deep Seabed Mining. *MDPI Journal on Sustainability*, vol. 15, issue 10, art. 8095. 2023.

<https://doi.org/10.3390/su15108095>

Zou, K., & Ye, Q. (2023). The relationship between UNCLOS and Customary International Law: Some reflections. *Marine policy*, vol. 154, art. 105691, 2023.

<https://doi.org/10.1016/j.marpol.2023.105691>

INSTRUMENTS

The Law Of the Sea

1982 United Nations Convention on the Law of the Sea (“UNCLOS”).

- UNTS: 1833.
- Adopted 10 December 1982; in force 16 November 1994.

1994 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” or “Agreement on Part XI”).

- UNTS: 1836.
- Adopted 28 July 1994; in force 16 November 1994.

The Mining Code

2019 Draft Regulations on Exploitation of Mineral Resources in the Area (“DER”)

- ISBA/25/C/WP.1
- 25th Session, Council session, part II, Kingston, on 15 to 19 July 2019, Agenda item 11.
- Published on 22 March 2019

2013 Regulations on Prospecting and Exploration for Polymetallic Nodules in the Area (“PMN”)

- ISBA/19/C/17
- 19th session, Kingston, on 15 to 26 July 2013.
- Published on 22 July 2013.

2012 Regulations on Prospecting and Exploration for Cobalt-Rich Ferromanganese Crusts in the Area (“CFC”).

- ISBA/18/A/11
- 18th session, Kingston, 16 to 27 July 2012.
- Published on 22 October 2012.

2010 Regulations on Prospecting and Exploration for Polymetallic Sulphides in the Area
("PMS")

- ISBA/16/A/12/Rev.1
- 16th session, Kingston, 26 April to 7 May 2010
- Published on 15 November 2010.

The International Seabed Authority (ISA) Standards and Guidelines

2019 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
- 25th session, Legal and Technical Commission session, part I, Kingston, 4 to 15 March 2019, Agenda item 11.
- Published on 30 March 2020.

2022 Draft guidelines on the preparation and assessment of an application for the approval
of a Plan of Work for exploitation

- ISBA/27/C/3
- 27th session, Council session, part I, Kingston, 21 March to 1 April 2022, Item 11 of the provisional agenda.
- Published on 31 January 2022.

2022 Draft standard and guidelines for the environmental impact assessment process

- ISBA/27/C/4
- 27th session, Council session, part I, Kingston, 21 March to 1 April 2022, Item 11 of the provisional agenda.
- Published on 31 January 2022.

2022 Draft guidelines on the tools and techniques for hazard identification and risk assessments

- ISBA/27/C/8
- 27th session, Council session, part I, Kingston, 21 March to 1 April 2022, Item 11 of the provisional agenda.
- Published on 31 January 2022.

2022 Draft guidelines for the establishment of baseline environmental data

- ISBA/27/C/11
- 27th session, Council session, part I, Kingston, 21 March to 1 April 2022, Item 11 of the provisional agenda.
- Published on 31 January 2022.

ISA Decisions

2023 Draft decision of the Council of the International Seabed Authority relating to the appointment of an interim director general of the Enterprise

- ISBA/28/C/L.2
- 28th session, Council session, part I, Kingston, 16 to 31 March 2023, Item 12 of the provisional agenda.
- Published on 2 February 2023.

2023 Decision of the Council of the International Seabed Authority on a timeline following the expiration of the two-year period pursuant to section 1, paragraph 15, of the annex to the Agreement relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea

- ISBA/28/C/24
- 28th session, Council session, part II, Kingston, 10 to 21 July 2023, Agenda item 10.
- Published on 21 July 2023.

Other UN instruments

1945 Statute of the International Court of Justice (“ICJ Statute”)

- Established in accordance with Chapter XIV of the United Nations Charter.
- Adopted 26 June 1945; in force 24 October 1945.

1972 United Nations (UN) Convention on International Liability for Damage Caused by Space Objects (“Space Liability Convention”)

- RES 2777 (XXVI)
- Adopted 29 November 1971; in force September 1972.

1972 United Nations (UN) Conference on the Human Environment in Stockholm (“Stockholm Declaration”)

- 2994/XXVII, 2995/UVII & 2996/XXII
- Adopted 16 June 1972.

1997 Agreement on Cooperation and Relationship between the United Nations and the International Tribunal for the Law of the Sea.

- A/RES/52/251
- Adopted 8 September 1997.

1994 United Nations (UN) Rio Declaration on Environment and Development (“Rio Declaration”)

- A/CONF.151/26 (Vol. I)
- Adopted 3 to 14 June 1992.

2001 International Law Commission (ILC) Draft articles on Prevention of Transboundary Harm from Hazardous Activities

- UN Doc. A/RES/56/82 (2001), UN Doc A/56/10
- Adopted 10 September 2001.

2001 International Law Commission (ILC) Draft Articles on Responsibility of States for Internationally Wrongful Acts (“ASR”)

- Rep. A/56/10
- Adopted 10 August 2001.

2005 United Nations Compensation Commission (UNCC) Report and Recommendations made by the Panel of Commissioners Concerning the Fifth Instalment of 'F4' Claims.

- S/AC.26/2005/10
- Published on 30 June 2005.

2006 International Law Commission (ILC) Draft principles on the Allocation of Loss in the Case of Transboundary Harm Arising out of Hazardous Activities

- UN Doc. A/61/10
- Adopted 11 August 2006.

2006 United Nations General Assembly (UNGA) Resolution on Sustainable fisheries, including through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and related instruments.

- A/RES/61/105
- Adopted 8 December 2006.

2015 United Nations (UN) Sustainable Development Goals.

2023 Agreement under the United Nations Convention on the Law of the Sea on the Conservation and Sustainable Use of Marine Biological Diversity of Areas beyond National Jurisdiction (BBNJ “Agreement”).

- A/CONF.232/2023/4
- Adopted: 19 June 2023; in force: pending.

Other instruments

1969 United Nations, Vienna Convention on the Law of Treaties (“Vienna Convention”)

- UNTS: vo. 1155
- Concluded 23 May 1969.

2004 Directive of the European Parliament and of the Council on environmental liability with regard to the prevention and remedying of environmental damage (“ELD”)

- EP Directive 2004/35/CE
- Adapted 21 April 2004

2009 United Nations Food and Agriculture Organization, International Guidelines for the Management of Deep-sea Fisheries in the High Seas (“FAO guidelines 2009”)

- Adopted 29 August 2008; in force 2009.

2005 Institut de droit international resolution on Obligations Erga Omnes in International Law, Krakow Session 2005. (“Institut de droit international 2005”)

- Adopted 27 August 2005.

2010 The International Maritime Organization (IMO) Code of International Standards and Recommended Practices for a Safety Investigation into a Marine Casualty or Marine Incident (“Casualty Investigation Code”)

- Resolution MSC.255(84)
- Adopted 16 May 2008.

Cases

Belgium v. Spain case. *Case concerning Barcelona Traction, Light, and Power Co., Ltd.*

International Court of Justice (ICJ), Gen.list.no. 50, 5 February 1970.

<https://www.icj-cij.org/case/50/judgments>

Argentina v. Uruguay case. *Pulp Mills on River Uruguay*. International Court of Justice

(ICJ), Gen.list.no. 135, 20 April 2010. <https://www.icj-cij.org/case/135/judgments>

Costa Rica v. Nicaragua case. *Certain Activities Carried Out by Nicaragua in the Border Area*. International Court of Justice (ICJ), Gen.list.no. 150, 2018. <https://www.icj-cij.org/case/150>.

- Summary of the Judgment of 16 December 2015 (Summary 2015/3)
- Summary of the Judgment of 2 February 2018 (Summary 2018/1)

SDC 2011. Case no. 17 *Responsibilities and obligations of States sponsoring persons and entities with respect to activities in the Area* (Request for Advisory Opinion submitted to the Seabed Disputes Chamber). ITLOS Advisory Opinion, 2011. <https://www.itlos.org/index.php?id=109>

ACRONYMS

ABNJ = Areas Beyond National Jurisdiction

BASE = Best Available Scientific Evidence

CCZ = Clarion Clipperton Zone

CFC = Cobalt-Rich Ferromanganese Crusts

CIGI = Centre for International Governance Innovation

CIL = Centre for International Law

DER = Draft Exploration Regulations

DSM = Deep Seabed Mining or Deep-Sea Mining

EEZ = Exclusive Economic Zone

EIA = Environmental Impact Assessment

EIS = Environmental Impact Statement

ELD = European Union Environmental Liability Directive

EMMP = Environmental Management and Monitoring Plan

FAO = Food and Agriculture Organization of the United Nations

ILC = UN International Law Commission

ISA = International Seabed Authority

ITLOS = The International Tribunal for the Law of the Sea

IUCN = International Union for Conservation of Nature

LTC = The ISA Legal and Technical Commission

LWG = The CIGI Legal Working Group

NGO = Non-Governmental Organization

PMN = Polymetallic Nodules, also known as Ferro-Manganese Polymetallic Nodules

PMS = Polymetallic Sulphides, also known as Seafloor Massive Sulphides

SDC = Seabed Disputes Chamber (ITLOS)

UNCC = UN Compensation Commission

UNCLOS = The United Nations Convention on the Law Of the Sea

UNGA = UN General Assembly

1. Introduction

1.1. The background and purpose of the research

Deep seabed mining, hereinafter also referred to as DSM or activities in the Area, has emerged into the limelight in the context of transitioning towards green economic structures. The name acts as the description for the nature of the activities: an initiation of mining activities for different metals and minerals at the seabed. DSM has been introduced as the potential source for different forms of metals, that can be used in batteries and other industries driving the envelope forward to produce a more sustainable society. Riddled with environmental uncertainties, the industry has received both proponent and opponent voices through a span of many years. Meanwhile, the commercial-industrial scale of mining activities has not begun yet, despite the industry being planned out actively for many decades. The reasons for the setbacks have been the environmental concerns. To be both economically and socially acceptable, DSM requires sufficient scientific knowledge of the risks of environmental damage and an efficient legal framework to successfully manage the DSM missions.

It is envisaged that activities in the Area should benefit the humankind as a whole, both economically and environmentally, without causing unprecedented damage. The knowledge about the marine environment and its various ecosystems has been slowly accumulating throughout the year, which has cautioned the international community to the possibility of environmental damage as a result of the activities in the Area. Various mining methods and technology, and their effects on the ecosystems, have been observed and studied during the exploration phase of deep seabed mining. This phase is known as the pre-phase for the commercial-industrial phase which is also referred to as the exploitation phase. With some certainty, specific causes have been envisaged, such as disruption of habitats and food sources for different species, as well as irreparable damage to the seabed. This data allows the international mining community to produce estimates and measures to implement necessary measures for the protection and preservation of the marine environment.

Indeed, it is expected that the envisaged exploitation phase will produce negative environmental effects such as pollution and interference with ecological balance, depending on the targeted geological area of mining and the mining methods. It's impossible to achieve a no-net-loss of

biodiversity, because industrial-scale remediation of the marine environment has not been developed yet.¹

While the negative environmental effects are an expected outcome of any industrial activity of this magnitude, the opponents of DSM argue that even the minimal extent of environmental damage should be considered unacceptable and should be avoided, in the context of the marine environment. Meanwhile, the proponents argue that collateral damage is an understandable side-effect or trade-off during the transition to green society. The prevailing uncertainty and distrust towards the efficiency of the pre-established legal framework for protection of the marine environment has led the argument of the countless voices of opposition. These cautionary approaches have stirred a prognosis that exploitation phase might not even initiate at all. Realistically, based on the preparation of the legal framework and lobbying towards the first exploitation missions, it is safe to assume that exploitation will indeed initiate. And soon, at that. These questions regarding the positives and the negatives of activities in the Area are riddled with socio-political implications and economic sentiments. This research paper chooses an objective approach and does not intend to find a solution or a middle ground between the prevailing arguments.

Damage, in connection to the activities in the Area, triggers the liability regime that is based on the 1982 United Nations Convention on Law of the Sea (UNCLOS) and its 1994 Implementing Agreement on Part XI. Essentially, the legal framework built around DSM, and other marine activities for that matter, is based on these legal sources. The liability regime determines the requirements for the establishment of liability as well as forms of resolution. However, there's a clear demand for a cohesive framework regarding the compensation of damage within this international legal framework. As mentioned, seabed mining is expected to cause damage to the marine environment and potentially to private and public interests of the humankind and individuals. Then why has the development of the legal framework been stagnant to produce definitive rules to determine compensation for damage?

Legal certainty is the key issue here for all relevant participants in the DSM community. In this context, legal certainty implies the rights of the wronged or injured parties to be receive appropriate compensation for damage where its due, and the rights of the parties conducting DSM missions to have realistic expectations for their liability, in a case of wrongfully caused

¹ Kung et al. 2021, p. 2.

damage. The problem for the latter occurs from the extremely high price-tag of environmental repairs and compensation, which can render their DSM activities too risky to be feasible.

1.2. Research question

The research question for this paper is as follows:

How is compensable damage determined under the legal framework of deep seabed mining in areas beyond national jurisdiction?

Compensable damage means damage that can be compensated. Determination of compensable damage requires the existence of damage, the possibility to recognize and quantify such damage, the solid evidence recognizing the perpetrator(s) to the damage or those who have attributed to the damage.² Unfortunately, the methods for determination of compensable damage is not sufficiently defined in the legal framework for activities in the Area. The research in this paper will investigate and reference the existing legal framework, the customary international law, international precedents, and the relevant literature by numerous legal scholars.

The discussion of compensable damage is relevant to determine the potential legal risks for both the wronged parties, as well as to the perpetrators of damage during the DSM missions. The interests of the former must be properly understood, while the consequences of the latter must be precisely predicted. Otherwise, for the latter the extremely high price-tag of environmental repairs and compensation can render their DSM activities too risky to be feasible and make the potential liability unbearable in the economic sense.

The subject of this paper concentrates on compensable damage in the context of international law and in the context of activities in the Area. An early rendition of “damage” was produced in the Space Liability Convention, which defines “damage” as “loss of life, personal injury or other impairment to health; or loss of or damage to property of states or of persons, natural or juridical, or property of international intergovernmental organizations.”³ Under this perception

² Khalatbari & Poorhashemi 2019, p. 25.

³ Space Liability Convention, article 1.

its considered that damage only occurs to subjective interests. Meanwhile, the plain definition of damage doesn't seem to consider collective interests of the international community.

The damage that occurs during the DSM missions is mostly environmental. Such damage commonly pertains transboundary elements to damage, having effects on a large territory, causing serious consequences, such as contamination of soil and water, with elements of nuclear or air pollution. The definition of environmental damage has been a core element of different international regulations, from 1972 Stockholm Declaration to 2016 United Nations (UN) Sustainable Development Goals and going forward.⁴ A sufficiently explanatory definition of environmental damage is “measurable adverse change in a natural resource or measurable impairment of natural resource services”.⁵

Each industry, that is predicted to contain risks for potential damage, be it towards third parties and/or the surrounding environment, should clearly receive delimited and defined rules and regulations to swiftly react and attempt to reinstate the *status quo*, once damage finally occurs. The rules and regulations should clearly indicate the consideration of damage, the grounds for liability, the types of damage to be compensated, and the mechanisms to ensure compensation for damage. Deliberation of compensable damage requires understanding of three key ingredients: (1) the liability regime of DSM, (2) the recognized forms of damage, and (3) the thresholds of damage.⁶ These three elements will be considered in this paper. The effect of this research is intended to contemplate the evaluation and prevention of damage, by implementing measures for environmental protection through the preparation for mining activities (plans of work, that will be explained in the paper) and during the mining missions. The research also considers recognition of damage and mechanisms of damage calculation in dispute settlement, both in international and domestic scenes.

1.3. Relevant bibliography and preceding research

The DSM has lately received some media coverage, but it has already been researched by legal scholars since 1960s. Since then, the mineral resources on the seabed were noted for their potential value for commercial use, which initiated an interest to extract these mineral resources

⁴ Khalatbari & Poorhashemi 2019, p. 21-22.

⁵ Handl 2019, p. 607-608.

⁶ Proelss & Steenkamp 2022, p. 570.

from the Clarion-Clipperton Zone (CCZ) in the Pacific Ocean in the 1960s and 70s. However, by 1980s many extraction projects had already been discarded as commodity prices fell, and the legal framework for mining activities were surrounded by many legal-political controversies. The resuscitated interest in early 2000s, driven by mineral demand and supply risks, has led to the development that we see today.⁷

A spike in the emergence of legal literature has been correlative with the resuscitated interests and with the active role of the International Seabed Authority (ISA) in propelling the DSM industry forward through the prospecting and exploration phases, towards the exploitation phase. Environmental matters have been discussed in the literature and have been in a central role. However, the more detailed subjects, such as individual rights and obligations, as well as liability, seems to have only gained traction in literature during the past 10 to 15 years. Such development is hardly surprising considering that the exploitation phase of DSM is only now beginning to materialise, and the actual risks of damage and liability have become the elephant in the room.

Perhaps the most influential current legal source for liability matters is the 2011 Advisory Opinion produced by the Seabed Dispute Chamber (SDC) under the International Tribunal for Law of the Sea (ITLOS), during which the Pacific Island States expressed their worries about the liabilities of developing sponsoring States for damage or wrongful acts in connection to DSM.⁸ Upon request of the Council of the ISA, on 1 February 2011, the SDC reviewed the Case no. 17, titled “Responsibilities and Obligations of States Sponsoring Persons and Entities with Respect to Activities in the Area, which produced the current legal insights concerning responsibility and obligations of sponsoring States with respect to activities in the Area. This case is used as a basis by many legal researchers, as it comprehensively elaborated on many ground rules established within the legal framework. The SDC also commented, on what damage it considers to be compensable.

During the initial research of potential subject to choose for this research paper, it was evident to the author that the topic of activities in the Area contains a vast amount of literature. The few potentially interesting subjects had been chosen, before the current subject was narrowed down to discuss the concept of compensable damage. The contemporary scholarly participation in the discussion of the subject of damage is noticeable, but more scarce and less fervent for the

⁷ Kung et al. 2021, p 2.

⁸ SDC 2011.

consideration of compensable damage. In fact, a vacuum persists for this topic, while it is recognized by some to be relevant for discussion. Damage in connection to DSM missions have been discussed globally in journals and papers of various universities and research organizations, not only from a scientific, but also from a legal standpoint. Perhaps, the most inspiration for the chosen topic of compensable damage came from the series of papers by a Legal Working Group from Centre for International Governance Innovation (CIGI), regarding legal issues of responsibility and liability to be addressed before the initiation of the exploitation phase.⁹

Different papers have also been produced by different environmental rights organisations¹⁰, in connection to different economic conferences¹¹, as well as within important intergovernmental power structures¹². The ISA itself has also produced plentiful amount of relevant material through its quite admirable activity at engaging stakeholder participation in development of the legal framework for DSM. Under the ISA, various materials for reading have been produced, including technical studies, reports on projects, reports on workshops, policy briefs and discussion papers.

It must be noted that most writings regarding DSM, and damage in particular, have been written in different legal journals and articles. Perhaps the most prominent sources for such articles were the Marine Policy and the Frontiers in Marine Science. Considering the relative novelty of the subjects, the scarcity of full-book literature is not surprising. However, this proved challenging, as the research for this paper required the gathering of information in small pieces from different resources. Therefore, while the amount of preceding research on compensable damage in the context of DSM is minimal, compared to other similar topics, the paper has sufficiently compiled the observations of many competent scholars.

The material for this paper has been found and compiled mostly through the online library system LUC Finna of University of Lapland, but also by using different methods of search on Google. The guiding paths for research materials has been observed, for example, through relevant ISA produced documents and their references towards legal literature. As mentioned, there has not been many studies or research onto the concept of compensable damage, although

⁹ Regarding the original idea; the most influential papers from this series were Mackenzie 2019 and Davenport 2019.

¹⁰ For example, the DSCC, IUCN and Client Earth.

¹¹ For example, the GBA & WEF.

¹² For example, the European Commission.

the issue has been mentioned by different legal writers, referencing also the SDC 2011, and its brief opinion on compensable damage.

1.4. Methodology and structure of the paper

Naturally, the general research format for this legal research paper is qualitative empirical research, as it does not consider numerical measurements for the reasoning of the research, in contrast to quantitative research. As the data presented in this paper is observed and suggestions for implementation of new provisions are made, the conclusions can be considered empirical.¹³

The specific research methods for this paper is a combination of doctrinal and comparative. Doctrinal research is intended to provide an organized illustration of the existing rules governing DSM activities and analyse the relationship between different provisions and international legal sources. Different legal sources are critically analysed, considering the original meaning and practical applicability of legal rules and regulations to definitory questions, and calculating the potential legal outcomes from the application of those rules and regulations. It also considers some functional dilemmas, as well as provides predictions and presents solutions for future developments.¹⁴

Comparative research, as the name suggests, provides a comparison. In this paper, the comparison is focused on comparing different legal sources and their language regarding provisions on same matters. Furthermore, the form of this comparative method is normative, as the research paper considers the best solutions for the legal issues presented in this paper. The paper also intends to present a cohesive analysis and arguments for the functionality of the regulatory suggestions. The research considers the preceding legal research and the suggestions of other legal writers, evaluating their functionality and comparing the conclusions. It should be noted that the comparative research, while focusing on international law, only provides comparisons between international law sources and case law, to determine possible trends of the development of the legal framework of DSM, as well as to provide suggestions for current discussions in development of exploitation regulations.¹⁵

¹³ Dobinson & Johns 2017, p. 20.

¹⁴ Hutchinson & Duncan 2012, p. 101.

¹⁵ Oderkerk 2015, p. 597–598, 600 & 603.

As to the consideration and comparison of different international legal resources, it must be recognized that international legal norms are applied on a vertical scale. This means that there is no real hierarchy of norms in international law, at least on a level of treaties or conventions. It is easier to consider, that the hierarchy or value of international legal norms depend on the geographical location, as western legal sources are more welcomed by the west, and eastern legal sources are more welcomed by the east. In that sense, in this research paper all legal sources are treated equally.¹⁶

There are issues with the arguments made in this paper, as it's naturally impossible to predict certain outcomes, especially in such globally relevant zeitgeist relating to DSM. The amount of relevant research is also comparatively minimal, but sufficient enough to contribute to the research of the current subject. The results are gained through the best efforts of the author but based merely on the current observation of the legal rules and regulations provided. Therefore, the paper intends to provide a qualitative insight into the considerations of compensable damage within the legal framework relating to DSM. The research methods chosen for this research paper seemed as the most functional choice for the presentation of the legal issues at hand.

The paper is structured into 6 chapters, with chapters 1 and 6 being introduction and conclusion chapters, respectively. In chapter 2 the paper begins introduction of the key concepts, the administrative and political environment around activities in the Area, and the legal framework connected to deep seabed mining. The intention of this extensive chapter is to introduce the reader to the topic, that seems to be novel even for seasoned legal professionals. It is important to delimit the legal boundaries and area of focus of the research. The legal framework subchapter also functions to prepare the reader for consideration of the legal sources, that are relevant to deep seabed mining in areas beyond national jurisdiction. The deliberation of compensable damage requires understanding of three key ingredients: (1) the liability regime of DSM, (2) the recognized forms of damage, and (3) the thresholds of damage.¹⁷ The key ingredients are discussed in chapters 3, 4, and 5, respectively.

¹⁶ Weiler & Paulus 1997, p. 562–565.

¹⁷ Proelss & Steenkamp 2022, p. 570.

2. Defining the regime of deep seabed mining

2.1. The Area

The UNCLOS defines the Area as the seabed and ocean floor and subsoil thereof that are located in areas beyond national jurisdiction (ABNJ).¹⁸ This definition encumbers multiple important functions. Firstly, containing the geological and topographic descriptions, it sets an important separation between different jurisdictions and legal regimes that exist in the marine environment. For example, the seabed is clearly separated from the water column, and so on. Secondly, the definition of the territorial limitations of the Area acts as an important separation between individual State rights and duties, and between common rights and duties of the international community. Finally, for the purpose of this paper, it directs the focus to the international context and international law.

First to discuss the Area, it's important to differentiate its territorial limits from the areas within national jurisdiction (hereinafter AWNJ). This approach is easier to present as an explanation to the delimitations between the AWNJ and ABNJ. Each coastal state extends its national jurisdiction to its land mass and internal waters, but also to its coastal waters, known as the territorial sea (12nm), contiguous zone (24nm), and the EEZ (200nm).¹⁹ These geographical dimensions, presented in nautical miles (nm), are measured from the baselines from which the breadth of the territorial sea is measured.²⁰ These baselines are fixed points that are calculated in various ways, based on the formation of the coast and the geological location of each particular state. The normal baseline for a coastal state is determined as the low-tide waterline along the coast. However, archipelagic states or coastal states with islands may need to utilize straight baselines where the furthest points of seaward extent may be chosen.²¹

The AWNJ commonly covers the surface, the water column, and the seabed, in the immediate vicinity of the coastal state. The seabed area is referred to as the continental shelf and it commonly extends to the 200nm, same as the EEZ. However, certain conditions allow the extension of the continental shelf beyond that limit.²² If certain topographical conditions are

¹⁸ UNCLOS, article 1, paragraph 1(1).

¹⁹ UNCLOS, articles 8 (internal waters), 3 (territorial sea), 33 (contiguous zone), and 57 (exclusive economic zone).

²⁰ UNCLOS, article 3 (Breadth of the territorial sea)

²¹ UNCLOS, articles 5 (normal baselines) and 7 (straight baselines).

²² UNCLOS, article 76 (definition of the continental shelf).

met, namely, if the continental shelf is deemed to be a natural prolongation of the coastal state's landmass, the coastal state may apply for an entitlement to an extended continental shelf. These extended entitlements are referred to as the Outer Continental Shelf (OCS). In accordance with UNCLOS provisions, such entitlements may only extend up to 350nm from the relevant baselines or 100nm from the 2500 metre isobath (depth from which the calculation of 100nm begins).²³

Such entitlements are certainly attractive to the coastal state, as it gains sovereign rights to commercially exploit the resources of the seabed (including oil, gas, minerals, marine genetic resources), conduct marine scientific research, and practice marine protection measures on the seabed.²⁴ For example, the coastal states are entitled to practice seabed mining operations of their own within their respective AWNJ, but also on the OCS.²⁵ The determination of the outer limits of OCS, as well as delimitation disputes between adjacent and opposite coastal states, is said to be challenging and a dispute-riddled topic, and therefore boundaries between the continental shelf and the Area sometimes remain fluid.²⁶ Everything else beyond that outer continental shelf limit, however, is considered to be the Area, and therefore governed by the rules of international law.

According to certain estimates, the Area comprises approximately two thirds of the world's oceans.²⁷ Meanwhile, other sources indicate that the partitioning of the Area is three quarters of the world's seabed. The seabed of the Area consists primarily of abyssal plains, with a colourful pallet of topographic characteristics such as seamounts, deep trenches, submarine ridges and hydrothermal vents, typically at the depths of 3,000 to 6,000 metres.²⁸ The seabed mineral resources, that are relevant in the context of this paper, are located within the Area.

The intention of deep seabed mining (DSM) is to find and extract these seabed mineral resources from the Area. These minerals are rich with different metals and can be utilized in metal production for different industries, such as battery manufacturing. The main three types of mineral resources are the Ferromanganese Polymetallic Nodules (PMN), Seafloor Massive Sulphides (PMS), and Cobalt-Rich Ferromanganese Crusts (CFC). PMNs are located in

²³ UNCLOS, article 76.

²⁴ UNCLOS, article 77 (Rights of the coastal State over the continental shelf).

²⁵ Miller et al. 2018, p. 2.

²⁶ Dingwall 2021, p 97.

²⁷ The EC website, "Protecting the ocean, time for action".

²⁸ Dingwall 2021, p. 97.

contract areas with a size of approximately 75,000 square kilometres each, of which 17 contract areas are located in the Northeast Pacific and the Indian Ocean. PMSs are mainly located at the hydrothermal vents on the mid-ocean ridges of the Atlantic and in sub-areas of the Indian Ocean, where 10,000 square kilometres are granted for the exploration purposes of each of the seven current contractors. CFCs are being explored at five different contract areas consisting of 3,000 square kilometres each, on seamounts in Northwest Pacific.²⁹ In this context, contract areas are simply the designated areas to which contractors receive an entitlement to conduct mining activities, as determined by the mining contract between the contractor and the ISA.³⁰

In accordance with the current scientific findings, the Pacific region has particularly rich deposits of said mineral resources.³¹ For example, rich deposits with high economic interests are located in the CCZ (north-central Pacific Ocean), the Penrhyn Basin (south-central Pacific Ocean), the Peru Basin (south-east Pacific), and the centre of the north Indian Ocean.³² The greatest concentrations of PMNs are located in the CCZ. Meanwhile, the seamounts for CFCs are currently more popularly found in the exclusive economic zones of Pacific Island states³³, and central equatorial Atlantic within the international areas.³⁴

Finally, it should be highlighted that the Area and its seabed resources are recognized as the common heritage of mankind (CHM). Therefore, any type of claims of sovereign rights towards the Area or its resources is impossible under international law.³⁵ The rights for all of the resources of the Area are ‘vested in mankind as a whole’ on whose behalf the ISA is to act.³⁶ The activities in the Area are governed by UNCLOS Part XI.

2.2. Mineral Resources and the Environment

Naturally, the specific characteristics of seabed mineral resources need to be introduced to the reader. Each of the three mineral types, as well as their typical geological locations and positioning in relation to the surrounding marine environment, will be described to further

²⁹ UBA 2023.

³⁰ See chapter 2.6.2.

³¹ Kung et al. 2021, p 2.

³² Miller et al. 2018, p 2–5.

³³ ECORYS 2014, p. 19–20.

³⁴ Hallgren & Hansson 2021, p. 5–6.

³⁵ UNCLOS, article 137 (Legal status of the Area and its resources)

³⁶ ECORYS 2014, p. 50.

understand the legal and political discussions around DSM. The three mineral types are the Ferromanganese Polymetallic Nodules (PMN), Seafloor Massive Sulphides (PMS), and Cobalt-Rich Ferromanganese Crusts (CFC).

PMNs are buried on the seafloor in extensive fine-sediment-covered abyssal plains and hills at depths of 3500 to 6500 meters.³⁷ They contain manganese and iron, as well as other important metals such as nickel, copper, molybdenum, rare earth elements and lithium.³⁸ They also contain traces of platinum and tellurium. They have a potato-like shape, and they are 4 to 10 cm in diameter. It's estimated that they have formed over millions of years through a process where the manganese in the seawater is condensed into a nodule substance, following which it is oxidized by bacteria, which creates a nodule form.³⁹

It has been found that PMNs host an encyclopaedic range of flora, sessile and mobile fauna, sponges, molluscs, et cetera. These organisms thrive on these nodules or inhabit the surrounding area in their immediate vicinity. Comparatively, they seem to host more life than PMN-free areas of the abyssal plains.⁴⁰ The method to mine PMNs consists of using large remotely operated nodule harvesters on the bottom of the sea. These harvesters have the capacity for different types of mineral extraction, including ploughing, scraping, and vacuuming. These futuristic machines resemble combine harvesters used in terrestrial farming. With these machines, it is estimated that one contractor may exploit approximately 300 – 800 km² of seabed per year.⁴¹

The PMSs are located at depths of 1000 to 4000 meters in small discontinuous areas near hydrothermal vents that emit high temperatures.⁴² Temperatures rise up to 400 degrees Celsius.⁴³ They are high in sulphide content, but also contain copper, zinc, gold, silver, and numerous other metals.⁴⁴ The minerals occur at hydrothermal vents (volcano- or chimney-like) that are formed near the cracks where tectonic plates pull apart and create a flow of cold water into the cracks. The cold water is heated with hot magma, reforming into alkaline water that contains hydrogen. The heated alkaline water returns to the seabed colliding with the cold water

³⁷ Tilot et al. 2021, p 5.

³⁸ Kung et al. 2021, p 2.

³⁹ Miller et al. 2018, p 2–5.

⁴⁰ Ibid.

⁴¹ Levin et al. 2016, p 250.

⁴² Tilot et al. 2021, p 5.

⁴³ Miller et al. 2018, p 2–5.

⁴⁴ Kung et al. 2021, p 2.

at the seabed, precipitating metals and sulphides, and creating vent structures. These vents form into chimneys and collapse over time, collecting around the exiting water of the vent, while also compounding minerals and metals. At those depths, there's no light penetration and the seabed life functions solely through chemosynthesis.⁴⁵

Mining of PMSs is conducted by using large remotely operated open-pit mining machine harvesters, that first require the sediment cover to be removed. The mining harvesters can carry different types of processing tools, with abilities to cut, crush, and gather the metal ore. These processed minerals are turned into a slurry and sent to the production support vessel through an enclosed riser and lifting system. Once processed on board of mining support vessels, the slurry is sorted and dewatered, separating it from the relevant metals. The remaining mass of sediment is discharged through tubes to various depths, depending on the operator.⁴⁶

Meanwhile, CFCs can be found on seamounts, volcanoes, and carbonate platforms at depths of 400 to 7000 meters.⁴⁷ They contain manganese, iron and different trace metals such as cobalt, nickel, copper, titanium, molybdenum, tellurium, platinum, zirconium, niobium, bismuth and rare earth elements.⁴⁸ The crusts are thin, and they are formed through condensation of minerals from the surrounding seawater. Their formation is estimated to take millions of years.⁴⁹ The mining occurs in soft sediments and is more complex than with PMNs.⁵⁰ The mining methods are similar to those previously mentioned, but the mining conditions are very different. The crusts have variable thickness, and the seamounts may be steep and rocky, which contributes to a difficulty of using the harvesting machinery. Similar to the other mineral resources, aboard the support vessel, the slurry is dewatered and sorted between relevant minerals and waste products, of which the latter is discharged back into the ocean.⁵¹

⁴⁵ Hallgren & Hansson 2021, p. 5.

⁴⁶ Levin et al. 2016, p 251.

⁴⁷ Tilot et al. 2021, p 5.

⁴⁸ Kung et al. 2021, p 2.

⁴⁹ Hallgren & Hansson 2021, p. 5.

⁵⁰ Levin et al. 2016, p 253.

⁵¹ Ibid.

2.3. Activities in the Area: Exploration or Exploitation

The meaning of DSM essentially relates to the concept of “activities in the Area”, which concerns all exploration and exploitation activities.⁵² In the 2011 ITLOS Advisory Opinion, the Seabed Disputes Chamber (SDC) has considered the functions that may be included in the definition of activities in the Area. For example, the SDC considered the role of the Enterprise, as envisaged in UNCLOS to function as the International Seabed Authority’s (ISA) own mining company. The role of the Enterprise is stated as the one conducting activities in the Area, “as well as the transporting, processing and the marketing of minerals recovered from the Area”.⁵³

The SDC excluded transporting, processing and marketing from the definition.⁵⁴ However, the transportation, necessary to lift and deliver the extracted minerals to the support ship or the installation, for shipboard processing where the lifting process ends, is included in that definition.⁵⁵ The SDC also considered that activities in the Area should include the protection of marine environment and the obligation to adopt protective necessary measures against the negative effects that occur from the activities in the Area. Such activities may include “drilling, dredging, excavation, disposal of waste, construction and operation or maintenance of installation, pipelines and other devices related to such activities”.⁵⁶

The SDC considered the definitions for *exploration* and *exploitation*, as they function to determine the contents of activities for each operating contractor. Exploration in simple terms considers the research and testing phase, while exploitation considers the commercial mining phase. Neither of the two concepts have been properly defined by UNCLOS.⁵⁷ The exploration regulations define *exploration* as “searching for deposits of polymetallic nodules in the Area with exclusive rights, the analysis of such deposits, the testing of collecting systems and equipment, processing facilities and transportation systems, and the carrying out of studies of the environmental, technical, economic, commercial and other appropriate factors that must be taken into account in exploitation.”⁵⁸

⁵² UNCLOS, article 1, paragraph 1(3).

⁵³ SDC 2011, paragraph 83. Referring to UNCLOS, annex IV, article 1, paragraph 1.

⁵⁴ SDC 2011, paragraph 87.

⁵⁵ SDC 2011, paragraph 96.

⁵⁶ SDC 2011, paragraph 85. Referring to UNCLOS, article 145.

⁵⁷ SDC 2011, paragraph 82.

⁵⁸ PMN Regulations, regulation 1, paragraph 3(a); PMS Regulations, regulation 1, paragraph 3(a); and CFC Regulations, regulation 1, paragraph 3(b)

Meanwhile, slightly modifying the definition of *exploitation* from exploration regulations⁵⁹, the Draft Exploitation Regulations (DER) define *exploitation* as “the recovery for commercial purposes of Resources in the Area with exclusive rights and the extraction of Minerals therefrom, including the construction and operation of mining, processing and transportation systems in the Area, for the production and marketing of metals, as well as the decommissioning and closure of mining operations.” The SDC however narrowed down their definition of “activities in the Area” in connection to both *exploration* and *exploitation* quite simply as “recovery of minerals from the seabed and their lifting to the water surface.”⁶⁰ It’s important to note, that exploration is an integral part of the current mining processes, but the potential risks of damage are envisaged to materialise particularly during the exploitation phase.

2.4. The Context and the Moratorium

The exploitation phase of DSM has not yet received the social and political acceptance from the international community. Comparisons are made between terrestrial mining and DSM, considering the potential benefits and risks of exploitation activities. The contemporary goal of low-carbon economy and rise of different green technologies has increased the demand for metal and mineral resources. Metals such as cobalt, lithium, nickel, copper, vanadium, and indium are used in battery technology⁶¹, photovoltaic cells and catalytic technology.⁶² Especially for batteries, the current decade is expected to see an unprecedented rise of raw material production.⁶³ The future infrastructure is envisaged to be less carbon intensive and the increased consumption of electronic goods is expected to follow prosperity. Global reserves of seabed metals would balance the economics as metal prices have increased since 2003, alongside new technological innovations.⁶⁴ The projected economic outcomes are also expected to be better when producing seabed metals.⁶⁵

⁵⁹ The exploration regulations only considered the recovery of PMNs, and didn’t consider the decommissioning and closure of mining operations (PMN Regulations, regulation 1, paragraph 3(b); PMS Regulations, regulation 1, paragraph 3(b); and CFC Regulations, regulation 1, paragraph 3(c))

⁶⁰ SDC 2011, paragraph 94.

⁶¹ GBA & WEF 2019, p. 21–22.

⁶² Miller et al. 2018, p 2-5.

⁶³ GBA & WEF 2019, p. 21–22.

⁶⁴ Hallgren & Hansson 2021, p. 6.

⁶⁵ Miller et al. 2021, p 2

However, the counterargument is that terrestrial mineral mining could remain sufficient in supporting the green transition prospects, when combined with the utilization of renewable technologies through potential future innovations. This would mitigate the necessity to resort to DSM.⁶⁶ It was reported that the Democratic Republic of Congo holds 50 percent of global cobalt terrestrial mine reserves, while 99 percent of lithium reserves are located in Chile, Argentina, Australia and China. The higher demand for metals and minerals provides economic benefits for states that conduct terrestrial mining.⁶⁷

But in a global context the management of mineral resources becomes more difficult, due to not being governed with internationally uniform rules and regulations.⁶⁸ The case for DSM is that the collective control and management of deep seabed mineral resources and their redistribution is envisaged to help improve the quality of life of developing countries. This is expected to occur through the benefit-sharing system, as the capacity building and inclusion programs for developing States. The benefit-sharing system suggests the sharing of DSM profits, especially with weaker states, in par with the principle of CHM.⁶⁹

It is argued that DSM would undermine the value and importance of terrestrial mining sites, hindering the economies of land-based mining states. Especially developing states would feel the brunt force of that effect, being the most vulnerable side to the economic changes. It was determined in a study that among developing States that are most likely affected by emergence of DSM, are Zambia, Democratic Republic of Congo, Eritrea, Chile, Mongolia, Peru, and a few others.⁷⁰ For example, in Democratic Republic of Congo, cobalt is a core pillar of the country's economy, with 80 percent of its exports being mining products. As a counter-argument, terrestrial mining, especially in developing States, has severe negative social, environmental and integrity impacts, as well as infrastructure challenges at the mining sites. Another example from the Democratic Republic of Congo indicates that around 15 to 30 percent of cobalt is extracted using manpower and basic hand tools. In many instances under hazardous working conditions. There are reports of deaths in the workplace due to poorly secured tunnels, exposure to fine dusts, particles, and DNA-damaging toxicity, with occurrences of various forms of

⁶⁶ Ibid.

⁶⁷ GBA & WEF 2019, p. 21–22.

⁶⁸ Ibid.

⁶⁹ Hallgren & Hansson 2021, p. 6–8.

⁷⁰ Lapteva et al. 2020, p. 6–11.

forced labour, as well as child labour. However, these artisanal mines are extremely important for local communities, often functioning as their sole source of livelihoods.⁷¹

UNCLOS urges developing States to be protected “from adverse effects on their economies or on their export earnings resulting from a reduction in 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...”⁷² Furthermore, the 1994 agreement urges ISA to “[s]tudy of the potential impact of mineral production from the Area on the economies of developing land-based producers of those minerals which are likely to be most seriously affected, with a view to minimizing their difficulties and assisting them in their economic adjustment...”⁷³

A report study to the International Seabed Authority (ISA) was produced regarding the effects of exploitation of PMNs on global metal markets. The study showed that the exploitation of PMNs would not cause serious adverse effects on copper, nickel, cobalt, or manganese markets. Certainly, for example, copper prices could see a slight decline due to reduced supply dependencies. However, any copper shortage would be resolved easily, either through the combination of terrestrial mining and recycling of copper, but additionally through the production of metals from DSM. Predictions did not produce signs of severe overproduction of nickel either. If the market was filled with the current intensity and continued increase of nickel production, then even the surplus of nickel from DSM would not have significant effects. Overproduction of terrestrial cobalt is already expected by year 2028. Regardless of the surplus from DSM production, cobalt market price should remain low. It was also found that the current manganese market should be able to absorb additional production of seabed manganese effortlessly if the same rate of demand continues and the current amount of potential DSM contractors remains the same.⁷⁴ It is argued that terrestrial mining is unlikely to become displaced significantly due to DSM. Rather, it will probably have an effect similar to a new competitor arriving on the mineral resource market.⁷⁵

The DSM industry is facing considerable political resistance, as world leaders, governments, communities, scientists, fishing communities, and the representatives of the automobile, tech, and other industries call for an urgent moratorium or precautionary pause of the exploitation

⁷¹ GBA & WEF 2019, p. 21–22.

⁷² UNCLOS, article 150 (h).

⁷³ The 1994 agreement, annex, section 1, paragraph 5(e).

⁷⁴ Lapteva et al. 2020, p. 6–11.

⁷⁵ Miller et al. 2021, p 2.

phase of DSM. The rush towards the initiation of DSM has been criticized due to the lack of coherent scientific data on possible effects of full-scale mining.⁷⁶ The process of DSM is considered by some commentators to lack social legitimacy.⁷⁷ Naturally, DSM poses severe environmental risks. It is argued that the potential damage resulting in connection to the activities in the Area would exceed the severity and scale of damage that is known to exist in connection to terrestrial mining. The difference, that guides the current political discussion, placing an antagonizing rift between terrestrial and seabed mining, is data. Terrestrial mining has centuries worth of data on environmental impacts. Terrestrial mining has shown environmental impacts and risks to local ecosystems, through soil and water pollution. However, this has been often evidenced to result from poor waste management which could be resolved through structural improvements.⁷⁸ In comparison, DSM requires less infrastructure and transport systems compared to terrestrial mining, where deforestation, large on-site facilities, and pollution of local waterways are commonplace.⁷⁹

The European Parliament adopted a resolution in 2018 that gained support with a strong majority of votes, titled “International Ocean governance: an agenda for the future of our oceans”. The resolution urged the European Commission and its Member States to refrain from sponsoring DSM contractors in the Area, and to refrain from issuing mining licences for coastal state continental shelf areas. The European Parliament also supported the calls for moratorium until proper scientific data regarding the effects of DSM have been sufficiently uncovered.⁸⁰ In 2021, many large corporations such as BMW, Volvo, Samsung and Google participated in a “Call for a Moratorium”, affirming that their production would not include the use of metals that are sourced from DSM activities. Months later, a coalition of scientists signed an international call “to pause deep seabed mining”, focusing on potential environmental risks.⁸¹

It was reported that the UN Environment Programme Finance Initiative had published a paper on June 2022, that urged investors to avoid the DSM industry due to its failure to fulfil the requirements of sustainable blue economy.⁸² The Alliance of Countries for a Deep-Sea Mining Moratorium was launched at 2022 UN Ocean Conference as well. Such pushback creates an unstable environment for investors, which may result in the failure of DSM completely. An

⁷⁶ DSCC Press release 2022.

⁷⁷ Jaeckel et al. 2023, p. 1.

⁷⁸ GBA & WEF 2019, p. 21–22

⁷⁹ Hallgren & Hansson 2021, p. 6

⁸⁰ Seas at Risk 2021, p. 28 – 29.

⁸¹ UBA 2023.

⁸² DSCC Press release 2022.

example of such outcome is the failed DSM attempt by Nautilus Minerals in Papua New Guinea, which had major financial difficulties as well as a public outcry against the company.⁸³

2.5. Legal framework

2.5.1. Developing the legal rules and regulations for activities in the Area

The legal framework that concerns the activities in the Area has been built on a strong basis of UNCLOS. The rules and regulations, that have been adopted on that basis, further specify the material and procedural conditions, outlining the rights and obligations in connection to DSM missions. The legal framework does consider active participants, but given the nature of the marine environment, it also provides for the rights of third parties that may be affected by the activities.

The United Nations Convention on the Law of the Sea (UNCLOS) is an epic. It was adopted in 1982, following a few decades of international negotiations, or in Philip Allots words “[a] treaty is a disagreement reduced to writing”. UNCLOS contains 320 articles and 9 annexes establishing a comprehensive legal regime for the management of global waters that is globally recognized to deal with all matters relating to the sea.⁸⁴ It came into force in 1994, upon receiving the required number of 60 signatories to be entered into force.⁸⁵ UNCLOS governs matters such as delimitation, environmental control, marine scientific research, economic and commercial activities, transfer of technology and the settlement of disputes.⁸⁶ To this day, it has been ratified by 169 signatories, including the UK and the EU.⁸⁷

Most UNCLOS provisions are regarded as customary international law. The Statute of the International Court of Justice (ICJ) considers international law as customary, if there is evidence of general practice accepted as law, and the general principles are recognized by civilized nations.⁸⁸ The peculiarities of UNCLOS, is that the convention was originally a codification of existing customary law of the sea. Furthermore, its continued development throughout the years

⁸³ Jaeckel et al. 2023, p. 1.

⁸⁴ UN Office of Legal Affairs (2018).

⁸⁵ House of Lords 2022, p. 8.

⁸⁶ UN Office of Legal Affairs (2018).

⁸⁷ House of Lords 2022, p. 7.

⁸⁸ ICJ Statute, article 38, paragraph 1(b & c).

has aimed at establishing a uniform legal framework for maritime matters. In fact, the 1982 UNCLOS was a codification of the four Geneva Conventions from 1958.⁸⁹ In essence, as the Convention continues to be applied by international courts and tribunals, as well as States Parties of the Convention, the newer provisions will slowly emerge as customary law.⁹⁰

Together with the UNCLOS entry into force, was adopted the 1994 implementing agreement on Part XI, concerning the Area (sometimes referred to as the New York Agreement, but hereinafter the 1994 agreement). Both Part XI and the 1994 agreement establish the international legal framework for DSM, containing the legal requirements for mining projects.⁹¹ In the context of the current topic, UNCLOS acts as the basis for all the researched functions and definitions of the legal framework, regarding damage and liability. Retracting to the previous contemplation on customary international law, an interesting question is the application of the 1994 agreement as customary international law. Interestingly, it may be observed that the repeated and evidenced application of its provisions, in connection to application of UNCLOS, provides for the consideration that the 1994 agreement is also customary international law.⁹²

Based on the mandate set out in UNCLOS Part XI, the International Seabed Authority (ISA) must continuously develop rules, regulations, and procedures regarding the orderly, safe, and rational management of the resources of the Area.⁹³ To this end, the ISA is tasked to adopt necessary measures to ensure the effective protection of the marine environment from harmful effects which may arise from the activities in the Area.⁹⁴ To this day, the ISA has issued multiple regulations and relevant guidelines regarding the mining activities of the deep seabed, regarding prospecting, exploration and exploitation (known collectively as the Mining Code). The Mining Code began with the codification of regulations on exploration activities, such as Regulations on Prospecting and Exploration for Polymetallic Nodules in the Area (PMN Regulations), Regulations on Prospecting and Exploration for Polymetallic Sulphides in the Area (PMS Regulations), Regulations on Prospecting and Exploration for Cobalt-rich Ferromanganese Crusts in the Area (CFC Regulations), and various other instruments, for example, the Environmental Management Plan for the CCZ, and the Recommendations for the guidance of

⁸⁹ Zou & Ye 2023, p. 2–3.

⁹⁰ Lee 2006, p.409.

⁹¹ UBA 2022.

⁹² Lee 2006, p.409.

⁹³ UNCLOS, article 150(a).

⁹⁴ UNCLOS, article 145.

contractors for the assessment of the possible environmental impacts arising from exploration for marine minerals in the Area.

Furthermore, the ISA develops arguably its most important regulations regarding the exploitation phase of DSM, namely Draft Exploitation Regulations (DER). The latest iteration was published in March 2019, with extensive commentaries and partial proposal editions published afterwards, based on workshops and discussions.⁹⁵ For the purposes of this paper the 2019 approved version will be used as basis for the research of exploitation regulations. The DER includes various regulations concerning, for example, the application process, the rights and obligations of contractors, and the protection of the marine environment, the contents of exploitation contracts, the inspection and compliance measures, and dispute settlement. Along with regulations, there are 10 annexes and 4 appendices consisting of standard templates and instructions regarding the content requirements of documents. The appendices contain the list of notifiable events, payment fee schedules, monetary penalties, et cetera.⁹⁶

Along with the DER, the ISA has produced a set of draft standards and guidelines for exploitation on various topics, including the approval procedure for plans of work, environmental impact assessments (EIAs), environmental management and monitoring plans (EMMPs), hazard identification and risk assessment, establishment of environmental baseline data, etc. The DER requires the ISA to develop these standards and guidelines in support of its implementation. Furthermore, it should be noted that the standards are legally binding to the contractors and the ISA, while the guidelines are considered soft law.⁹⁷

A turn of events in 2021 initiated worried discussions and a rush to finish the exploitation regulations. The Republic of Nauru, in June 2021, invoked a treaty provision referred to as the “two-year rule”.⁹⁸ In normal conditions, the ISA must establish the rules, regulations and procedures necessary to facilitate the approval of plans of work for exploration or exploitation, and it is provided that the ISA may use all the time needed to establish said rules.⁹⁹ However, upon request of a State, the ISA must adopt said rules, regulations and procedures within two years from the date of the request.¹⁰⁰ If the ISA fails to make this deadline, it must begin to

⁹⁵ ISBA/25/C/WP.1 Draft Regulations on Exploitation of Mineral Resources in the Area (“DER”)

⁹⁶ Willaert 2019, p. 5.

⁹⁷ ISA website, “Draft standards and guidelines”.

⁹⁸ Singh 2022, p. 375.

⁹⁹ The 1994 agreement, annex, section 1, paragraph 15 & 15(a).

¹⁰⁰ The 1994 agreement, annex, section 1, paragraph 15(b).

consider and provisionally approve the pending plans of work for exploitation regardless, while relying on the existing regulations of that moment.¹⁰¹

The prescribed time started from 30 June 2021 and was later deferred to 9 July 2021.¹⁰² During Session 28 of the ISA in 2023, it was noted by the Council that the expiration of the two-year deadline was on 9 July 2023, but that the exploitation regulations were unfinished. It was agreed that active work would continue to elaborate the rules, regulations, and procedures of exploitation regulations, and in the event that a plan of work for exploitation was submitted, the application of section 1, paragraph 15, of the annex of the 1994 agreement would be considered.¹⁰³ The situation illustrates the unpreparedness of the ISA and the international community to produce a timely response to such requests. However, in 2021, covid-19 was still a limiting factor for the organization of international meetings to move important matters forward.

2.5.2. Judicial bodies leading the way towards a coherent framework

The DSM legal framework requires a concrete of dispute settlement mechanisms and bodies to guide the development of the regime through practical interpretation of the legal rules and through creation of case law. When UNCLOS was established in 1982, alongside a sophisticated dispute settlement system was established, providing contentious jurisdiction to maritime matters for the International Tribunal for the Law Of the Sea (ITLOS), the International Court of Justice (ICJ), the arbitral tribunal, or the special arbitral tribunal. Essentially, the freedom of choosing the dispute settlement venue is left for the disputing States.¹⁰⁴

ITLOS is sometimes considered as the main tribunal for maritime matters. The official website describes it as “an independent judicial body... [that] has jurisdiction over any dispute concerning the interpretation or application of UNCLOS, and over all matters specifically provided for in any other agreement which confers jurisdiction on the Tribunal.”¹⁰⁵ Holding its seat in Hamburg, the Tribunal was established along with UNCLOS, in 1982. ITLOS does not act under the direct authority of the UN but acts as an individual organization. However, both

¹⁰¹ The 1994 agreement, annex, section 1, paragraph 15(c).

¹⁰² Singh 2022, p. 375.

¹⁰³ ISBA/28/C/24

¹⁰⁴ Rocha 2023.

¹⁰⁵ ITLOS Website, "Latest News".

maintain a close connection and cooperation in accordance with the 1997 Agreement on Cooperation and Relationship between UN and ITLOS.¹⁰⁶

Under ITLOS, A Seabed Disputes Chamber (SDC) and its *Ad Hoc* Chambers were created.¹⁰⁷ Their *ratione materiae* concentrates on Part XI of UNCLOS. SDC holds an exclusive jurisdiction to interpret and apply the legal framework concerning the Area.¹⁰⁸ The potential disputes may concern the interpretation, application or violation of Part XI, annexes, the mining code or mining contracts, et cetera.¹⁰⁹ Parties to disputes may be States Parties, the International Seabed Authority, the Enterprise, state enterprises and natural or juridical persons.¹¹⁰ States that have not ratified UNCLOS cannot enter claims with the SDC, as it doesn't have the jurisdiction to service non-party states.¹¹¹ The SDC does not have jurisdiction to review the conformity of rules, regulations, and procedures of the ISA with the relevant rules of UNCLOS, nor to exercise any powers towards the ISA.¹¹² However, the future SDC precedents will provide for an important legal source for the deep seabed legal regime.

In fact, SDC holds the sole advisory jurisdiction concerning the Area, in accordance with Annex VI of UNCLOS.¹¹³ Advisory opinions in general are defined as a judicial service to assist with comprehension and compliance with international obligations, while being non-binding. There are exceptional cases, however, where their advisory opinions may function as a preliminary ruling, a dispute settlement mechanism, or an appeal instance, having the compulsory effect.¹¹⁴ Therefore, advisory opinions cannot be enforced. But they are regarded as an authoritative statement, providing clarification of international law with a strong political and regulatory effect on an international level.¹¹⁵ ITLOS itself has stated that the legal findings in advisory opinions have an equally compelling effect as regular judgements, and even under the Statute of the ICJ, they have the same value as regular judgements.¹¹⁶ There is an element of freedom. As advisory opinions have a moral authority, but lack the authority of *res judicata*, it is possible to produce different opinions as the economic, political and legal environment changes.¹¹⁷

¹⁰⁶ ITLOS Website, "Relationship with the United Nations". In accordance with the 1997 Agreement on Cooperation and Relationship between the United Nations and the International Tribunal for the Law of the Sea.

¹⁰⁷ ITLOS Website, "Chambers".

¹⁰⁸ Rocha 2023.

¹⁰⁹ UNCLOS, article 187 (a-f).

¹¹⁰ ITLOS website, "Jurisdiction of the Seabed Disputes Chamber".

¹¹¹ UNCLOS, article 187.

¹¹² ITLOS website, "Jurisdiction of the Seabed Disputes Chamber".

¹¹³ Garcia-Revilla 2017, p. 428-429.

¹¹⁴ Carrillo 2023, p. 237-240.

¹¹⁵ Client Earth 2023, p. 3, paragraph 6.

¹¹⁶ Carrillo 2023, p. 237-240. Referring to the Statute of the ICJ, article 38, paragraph 1(d).

¹¹⁷ Ndiaye 2010, p. 579.

Advisory opinions are held in high regard, which is evident from 2011 ITLOS Advisory Opinion, produced by the SDC. It is considered to properly interpret the liability regime that is intended for activities in the Area.¹¹⁸ Naturally, there are loopholes, which should not be surprising considering the novelty and complicated nature of DSM. It is uncertain, how certain mechanisms of the liability regime would function in practice. Despite being produced over ten years ago, the 2011 advisory opinion does not lose its topicality. Some even refer to it as “historic”.¹¹⁹ It is also considered as one of the most comprehensive treatments of international environmental law by any international court or tribunal.¹²⁰

2.5.3. Other instruments apply as well

Naturally, the legal regime for DSM does not prejudice the application of other international legal sources if they happen to apply to a specific situation. For example, in relation to other conventions and international agreements, it is stated that UNCLOS does not alter the rights and obligations of States Parties arising from other agreements that are compatible with UNCLOS, and which do not prejudice the rights of States Parties or performance of their obligations under UNCLOS. Furthermore, States Parties may conclude bilateral and multilateral agreements modifying or suspending the provisions of UNCLOS. However, it must be noted that such agreements must not derogate or prejudice the object, purpose and basic principles of UNCLOS.¹²¹

Another example is the context of liability matters, for which UNCLOS states that the liability of a State Party or an international organization can be triggered for its failure to carry out its responsibilities, thus attributing to the cause of damage, without prejudice to other international laws.¹²² The “without prejudice” clause allows consideration of other legal sources. For example, the International Law Commission of the UN (ILC) has produced numerous substantive and important legal instruments, for example the notable 1969 Vienna Convention on the Law of Treaties. Substantively relevant ILC documents to be considered here may be 2006 ILC Draft principles on the Allocation of Loss in the Case of Transboundary Harm Arising out of Hazardous Activities, 2001 ILC Draft articles on Prevention of Transboundary Harm

¹¹⁸ SDC 2011.

¹¹⁹ Xu et al. 2023, p. 2.

¹²⁰ Carrillo 2023, p. 237-240.

¹²¹ UNCLOS, article 311, paragraphs 2 & 3 (Relation to other conventions and international agreements).

¹²² UNCLOS, article 139, paragraph 2.

from Hazardous Activities, and 2001 ILC Draft Articles on Responsibility of States for Internationally Wrongful Acts. Also, to be considered is the UN 1994 Rio Declaration on Environment and Development. These legal sources are thoroughly applied to matters of transboundary and international liability in maritime matters.

Finally, while not directly discussed in this paper, the activities in the Area are also partially managed through the national laws of sponsoring States. The contents and provisions of domestic legal systems are rarely harmonized between different States.¹²³ However, States entering a sponsorship agreements with contractors (sponsoring States) must adopt necessary and appropriate laws, regulations and administrative measures within their respective domestic legal systems.¹²⁴ For example, one of the prominent measures for the sponsoring States is to establish “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.”¹²⁵ The SDC construed two positive objectives for these obligations. Firstly, they intend to add additional measures to ensure contractor’s compliance with UNCLOS provisions and its related instruments, as well as the mining contract. Once contractors are incorporated in their respective sponsoring States, the domestic laws have a more direct and swift reaction to their actions. Secondly, by adopting appropriate domestic laws and measures, sponsoring States are exempt from liability for the damage caused by the contractor during activities in the Area.¹²⁶

Sponsoring States are responsible to manage and monitor the activities of their sponsored contractors.¹²⁷ This may become problematic during the exploitation phase of DSM. States adopt domestic measures of varying qualities and efficiency. Dependence solely on domestic legal systems, to resolve issues regarding damage and liability, does not seem rational. There are no harmonized measures or legal provisions to be directly adopted by States, to counter the significant issues and topics. The research question in this paper has been raised due to the lack of proper definition of *compensable damage* within the international maritime legal framework. This implies delegation of the responsibility on sponsoring States and their domestic legal systems to provide definitions to damage thresholds, and to establish mechanisms of recourse and compensation. Since State competence varies, a forum shopping issue arises, where

¹²³ Willaert 2020, p.1.

¹²⁴ UNCLOS, annex III, article 4, paragraph 4.

¹²⁵ UNCLOS, article 235, paragraph 2.

¹²⁶ SDC 2011, paragraph 217.

¹²⁷ Rayfuse 2011, p. 476.

contractors will select a jurisdiction with more lenient national regulations regarding liability and compensation.¹²⁸

Finally, for the purposes of this paper, the legal rules and regulations presented here will be referred to as the legal framework. Such decision adds simplicity to the reading experience, as adherence to these rules and regulations is expected by the participants of activities in the Area.

2.6. Participants of activities in the Area

2.6.1. International Seabed Authority

The International Seabed Authority (ISA) has been mentioned multiple times in the previous chapters, which should be telling about its role in the legal framework, without any understatement. ISA is an autonomous international organization that organizes, controls, and carries out activities in the Area, in accordance with the powers provided to it by UNCLOS and related instruments. It acts for the benefit of all humankind. The ISA was established in 1994 and has its headquarters in Kingston, Jamaica. Currently, all 169 State Parties of UNCLOS, including the EU, are members of ISA.¹²⁹ There are also approximately thirty participant observer states, such as the US, as well as international organisations and NGOs.¹³⁰

The ISA functions through its multiple administrative organs, including the Assembly, the Council, and the Secretariat. The Assembly functions as the supreme organ of the ISA. All ISA members participate in adopting general policies that are within ISA competence. The Assembly approves Council's recommendations of rules, regulations, and procedures regarding activities in the Area. It also undertakes general and systematic reviews of legal framework operation over every five years. The Council functions as the executive organ, establishes the specific policies sought after by the ISA, supervises, and coordinates the implementation of Part XI, approves plans of work, and monitors the activities in the Area, as well as compliance with UNCLOS and related instruments.¹³¹ Meanwhile, The Secretariat conducts ISA's daily administration and bureaucratic duties, led by Secretary-General.¹³²

¹²⁸ Svendsen 2020, p. 607-608.

¹²⁹ The ISA website, "About ISA"

¹³⁰ Dingwall 2021, p. 178-180.

¹³¹ ISA 2019, p. 21-23.

¹³² Dingwall 2021, p. 179-181.

The Council also has subsidiary organs, including the Legal and Technical Commission (LTC), the Finance Committee, and the Economic Planning Commission. The latter has not been established yet. However, the LTC has an important function in the development of the legal framework for DSM. It is the body that conducts the formulation of rules, regulations, and procedures, considers all necessary elements relating to the activities in the Area, and provides legally sound solutions. It also keeps legal aspects under constant review, and proposes amendments to the Council, if needed. The Finance Committee manages and organizes the financing and financial management of ISA and provides recommendations to the Assembly and the Council concerning the drafting of financial rules, regulations, and procedures.¹³³

The ISA has prescriptive and executive powers provided to it under Part XI, which it effectively utilizes to maintain the regulatory regime of DSM and to practice supervision over the activities in the Area.¹³⁴ The ISA practices enforcement powers by monitoring contractor and sponsoring State performance, inspecting mining installations, and enforcing compliance of contractual terms. The ISA also acts a licensing authority, to whom the contractors send their formal written plans of work for review. Activities in the Area are possible only through the approval of ISA.¹³⁵ The ISA also promotes and facilitates marine scientific research in the Area; conducts active measures to protect and conserve the natural resources, vegetation, and wildlife of the Area; establishes a mechanism for equitable sharing of financial and other economic benefits resulting from DSM, as well as a mechanism for transfer of mining technology to State Parties.¹³⁶

It is envisaged that persons practicing activities in the Area include the State Parties, state enterprises, or natural or judicial persons possessing the nationality of their sponsoring States. However, in the original 1982 UNCLOS, another body was intended to practice its own DSM activities. This body is known as the Enterprise. It was intended to be an extension of the ISA to function as another participant contractor in the Area.¹³⁷ The Enterprise was intended mine the seabed through the cooperative assistance and support of State Parties and by using the technological knowledge and equipment of other private contractors. It was envisaged that through its activities, it would be able to share the mining profits and economic benefits directly

¹³³ ISA 2019, p. 21–23.

¹³⁴ Dingwall 2021, p. 179–181.

¹³⁵ Ibid, p. 185-188.

¹³⁶ Ngum & Rene 2021, p. 3–4.

¹³⁷ ISA 2019, p. 21–23.

through a functioning ISA benefit sharing system. Meanwhile, it would bear the risk of liability over damage resulting from the activities.¹³⁸

As a downside, the initial plans were considered unfair by industrialized States, since the private companies were considered competitors to the Enterprise, while they were expected to fund the Enterprise and provided it with technical abilities to conduct the mining. The criticized structure was discontinued by the 1994 agreement.¹³⁹ These events slowed the establishment of the Enterprise, but recent developments, including the published draft decision to appoint the interim director general of the Enterprise, have pushed the initiation process forward.¹⁴⁰ Essentially, it is envisaged that Enterprise missions would begin through joint ventures with State Parties, rather than on its own.¹⁴¹ If established, the Enterprise would encounter the same obligations and risks regarding damage, with the possibility of being held liable to compensate damage if it were to occur.¹⁴²

“Truth is the daughter of time” said Aulus Gellius in the 2nd century AD. Since its inception, DSM has received a barrage of critique regarding the environmental protection and preservation, and the potential risks to biodiversity and continuation of species. It is unclear, how these factors will be mitigated. Critique has also been voiced towards the ISA. Concerns have been raised towards its structure and political representation as voiced in an IUCN seminar “Shining a light on deep-sea mining”. There are concerns regarding the lack of transparency where, for example, the details of the current exploration contracts are not publicly available. The meetings of the LTC, which has strong powers in the ISA, are held behind closed doors. Only summaries available after those meetings. The LTC recommendations are held in high regard and a majority vote is required to overturn its opinions over vital matters. Therefore, the lost opportunity to participate in LTC meetings may lead to a dangerous situation of arbitrary and surprising decisions. There’s also a conflict of interest, as the ISA is both the regulator of the activities, but also the beneficiary of profits from issuance of licences for mining. Therefore, it may have a lower threshold to approve applications to less-sufficient applicants.¹⁴³ As mentioned in chapter 2.4., the international community is hesitant to initiate activities in the Area. If an organization leading the global community exodus towards DSM seems

¹³⁸ Willaert 2021 (The Enterprise), p. 2-3.

¹³⁹ Ngum & Rene 2021, p. 11–12.

¹⁴⁰ See f.eg. Draft decision of the Council of the International Seabed Authority relating to the appointment of an interim director general of the Enterprise ISBA/28/C/L.2

¹⁴¹ Ngum & Rene 2021, p. 11-12.

¹⁴² Willaert 2021 (The Enterprise), p. 4.

¹⁴³ IUCN Marine videoseminar 2022.

untrustworthy to some, then reaching an agreement and cooperation becomes a rational uncertainty. Therefore, truth is the daughter of time.

2.6.2. The Contractors

Contractors are the main actors of DSM. They conduct the mining in the deep seabed. They are also in the most relevant position in relation to the risk of damage to the marine environment. The term “contractor” stems from mining companies entering into a mining contract (exploration or exploitation contract) with the ISA. The mining contract is a signed version of the plan of work, that is first submitted to the ISA for approval. The plan of work itself becomes the mining contract, and it provides the contractor the rights to explore and exploit the minerals from the designated mining area.¹⁴⁴ Contractors are the entities conducting different forms of mining activities, being the ones handling the physical tasks, from equipment to transportation of the resource minerals. Contractors may be States, private or state-owned companies, or the Enterprise.¹⁴⁵

At the time of writing, there were a total of 31 contracts with 22 different contractors.¹⁴⁶ The duration of exploration contracts is 15-years, while exploitation contracts last for 30-years.¹⁴⁷ Many larger countries currently hold several of these exploration contracts. Private applicants for mining licenses are usually large multinational corporations, often acting through smaller subsidiaries. Which is not surprising considering the hefty application fee of US\$500,000 and the following funds required to conduct mining activities.¹⁴⁸ Some of the more known “frontpage” private contractors are The Metals Company, Global Sea Mineral Resources NV (a subsidiary of DEME Group), and UK Seabed Resources (a subsidiary of Loke Marine Minerals).

Receiving the entitlement or licencing to conduct activities in the Area cannot be considered easy by any measure. The preparation required for compilation of plans of work, as well as the following application procedures are extensively described within UNCLOS. Contractors may conduct mining only after their respective plans of work have been approved and strictly in

¹⁴⁴ Willaert 2021 (Regulating Deep Sea Mining), p. 6-7.

¹⁴⁵ Feichtner 2020, p. 2.

¹⁴⁶ ISA website, “exploration contracts”

¹⁴⁷ DER, regulation 20 (Term of Exploitation Contracts).

¹⁴⁸ UNCLOS, annex III, article 13, paragraph 2 (Financial terms of contracts).

accordance with their plans of work.¹⁴⁹ Contractors apply for their mining licenses by submitting a plan of work to the ISA.¹⁵⁰ There are certain qualifications to fulfil in order to have the plan of work approved.¹⁵¹ Among other requirements, the applicant is required to hold the nationality of a sponsoring State or be under control and sponsorship of the sponsoring State.¹⁵² The sponsoring State in turn must ensure within its legal system that the contractor carries out the mining in conformity with the terms of its contract and the obligations under UNCLOS.¹⁵³

The plan of work for exploitation activities must contain sufficient information for the ISA to produce a decision. Required information includes sufficient information about the applicant, the intended area of exploitation, the applicant's technical and financial capabilities to carry out the activities in accordance with the plan of work, et cetera.¹⁵⁴ In their applications, contractors must designate an area of interest that is sufficiently large. The area of interest must also hold sufficiently estimated commercial value to allow two parallel mining operations, where this area is divided into two parts based on estimated equal commercial values. One half becomes the area to which the contractor is entitled, and the other half becomes the reserved area. The latter is intended to serve DSM activities of the Enterprise and/or developing States.¹⁵⁵ The intention is to ensure their access to sufficient seabed mineral resources but leaving the workload of finding these areas to the technically capable contractors.¹⁵⁶

In connection to the creation of plans of work, the Mining Code relies on contractors to gather the necessary information concerning environmental baselines and to establish and implement programs for monitoring the impacts of mining. This has been affirmed by the Secretary-General of the ISA (Michael Lodge) referring to surveys and sampling data as potentially the most significant source for geographic information regarding the CCZ. However, UNCLOS doesn't allow the delegation of data gathering obligations entirely on contractors. Understandable, as such reliance wouldn't be logical considering the financial interests of the contractors.¹⁵⁷ States are also obliged "to observe, measure, evaluate and analyse by recognized

¹⁴⁹ UNCLOS, article 153, paragraph 3 (System of exploration and exploitation)

¹⁵⁰ UNCLOS, annex III, article 3 (Exploration and Exploitation)

¹⁵¹ UNCLOS, annex III, article 6 (Approval of Plans of Work).

¹⁵² UNCLOS, annex III, article 4 (Qualifications of applicants). Requirement of UNCLOS, article 153, paragraph 2(b).

¹⁵³ UNCLOS, annex III, article 4, paragraph 4.

¹⁵⁴ DER, annex I & II (Application for approval of a Plan of Work to obtain an exploitation contract & Mining Workplan)

¹⁵⁵ UNCLOS, annex III, article 8.

¹⁵⁶ Willaert 2021 (The Enterprise), p. 2.

¹⁵⁷ Feichtner 2020, p. 5-6.

scientific methods, the risks or effects of pollution of the marine environment”¹⁵⁸, and to assess the potential effects of activities that may cause substantial pollution of or significant and harmful changes to the marine environment.¹⁵⁹ One could argue that the sponsoring State shares those financial interests with their contractors.

The ISA is limited in its grounds to deny a plan of work. However, denial is possible if the intended mining area is already reserved by another contractor or the Enterprise¹⁶⁰, if the intended mining area and its marine environment are at risk of serious harm¹⁶¹, or when the sponsoring State overseeing the plan of work has a previously approved plan of work over a mining area, which together with the newly intended mining area would exceed certain dimensional limits, thus being against the anti-monopoly rules of the legal framework.¹⁶²

Considering the subject of compensable damage, legal certainty is the key issue for contractors. While the science regarding potential negative environmental effects already exists, the practical legal consequences are not sufficiently defined to produce legal certainty. In this context, legal certainty implies the entitlement of third parties to appropriate compensation for damage where its due. For contractors it implies the predictability of legal consequences and liability for wrongful damage. The problem for the contractor occurs from the extremely high price-tag of environmental repairs and compensation, which could render their DSM activities too risky to be feasible.¹⁶³

2.6.3. The sponsoring States

To have their plan of work approved by the ISA, contractors must also conclude a sponsorship agreement with at least one UNCLOS State Party.¹⁶⁴ A State, acting as a “sponsor” for the activities of the contractor is referred to as a “sponsoring State”. The intention behind the requirement of a sponsorship is to effectively reach the objectives set forth by UNCLOS, because State Parties are directly legally bound by the rules and regulations of UNCLOS and its instruments. Sponsoring States must extend their control over contractors and enforce these

¹⁵⁸ UNCLOS, article 204, paragraph 1.

¹⁵⁹ UNCLOS, article 206.

¹⁶⁰ UNCLOS, annex III, article 6, paragraph 3(a)

¹⁶¹ UNCLOS, annex III, article 6, paragraph 3(b). Referring to UNCLOS, article 162, paragraph 2(x).

¹⁶² UNCLOS, annex III, article 6, paragraph 3(c). The referred anti-monopolistic rules can be found f.eg. in UNCLOS, article 150(g) (Policies relating to activities in the Area).

¹⁶³ Planet Tracker 2023, p. 5.

¹⁶⁴ UNCLOS, article 153.

rules and regulations through their domestic legal systems.¹⁶⁵ The sponsorship, therefore, acts as verification of determination to secure conformity of a contractor with the rules and regulations.¹⁶⁶ The domestic legal systems are expected to be sufficient in materializing the objectives of the legal framework.¹⁶⁷ It is important to note, that sponsoring States are equally liable for damage that is caused by their sponsored contractor. This liability can only be avoided, if the sponsoring State has fulfilled its obligations, including the implementation of sufficient domestic legislation.¹⁶⁸

Sponsoring States have different requirements set for the establishment of sponsorships. A sponsorship usually requires the contractor to either possess the nationality of the sponsoring State or to be under the effective control of that State. Most States, within their national legislations, apply the nationality criterion as their preferred option.¹⁶⁹ Sponsorships need to be proven to the ISA. To satisfy the conditions of a sponsorship and sufficiently establish “effective control” over the contractor, it is sufficient to present the act of incorporation, or conferring of nationality, in connection to the issuance of a certificate of sponsorship, that indicates the responsibility of a sponsoring State for the activities of the contractor.¹⁷⁰ It’s also possible for a contractor to hold a sponsorship of multiple State Parties. This is possible when the contractor has multiple nationalities, or when a contractor is a national of one State and under control by another State, or when the contractor is controlled by nationals of another State.¹⁷¹

Developing States have been at the forefront of joining the activities in the Area. For them, the opportunity was initially envisaged to occur through the Enterprise. However, currently that participation is realised by acting as a sponsoring State for a larger corporation. Such participation may be very lucrative for the sponsoring State, but profiting from the exploitation phase requires some understanding to form a smart arrangement with the contractor regarding technology transfer, benefit sharing, communication, etc.¹⁷² Otherwise, the worst-case-scenario might be liability and ensuing financial burden, that might be too much for a developing State.¹⁷³

¹⁶⁵ SDC 2011, paragraph 75.

¹⁶⁶ SDC 2011, paragraph 78.

¹⁶⁷ SDC 2011, paragraph 75.

¹⁶⁸ UNCLOS, article 139, paragraph 2.

¹⁶⁹ Willaert 2020, p. 3.

¹⁷⁰ UNCLOS, articles 139 & 153, paragraph 4 & annex III, article 4, paragraph 4.

¹⁷¹ SDC 2011, paragraph 190. Referring to UNCLOS, annex III, article 4, paragraph 3.

¹⁷² Pecoraro 2022.

¹⁷³ Planet Tracker 2023, p. 5.

Participation of developing States is in par with the goals set out in UNCLOS and it is encouraged to consider their special interests and needs.¹⁷⁴ However, the parts of UNCLOS concerning the responsibilities or liabilities of sponsoring States do not regulate towards preferential treatment of developing sponsoring States, therefore the responsibilities and liabilities of sponsoring States apply to all sponsoring States equally, regardless of them being developing or developed.¹⁷⁵ To this end, legal certainty is an important issue as well. The practical consequences are not sufficiently defined to produce legal certainty. Sponsoring States also require legal predictability, if or when their sponsored contractor causes damage during a DSM mission. The problem for the sponsoring States occurs from the extremely high price-tag of environmental repairs and compensation. Since developing and developed States are held in same regard in the context of liability, the liability for marine environmental damage could demolish the domestic economies of developing States completely, while the DSM regime is intended to incentivise their participation in DSM activities.¹⁷⁶

The refusal to provide preferential treatment is explained by the phenomenon of “sponsoring States of convenience” or forum shopping, where commercial enterprises would attempt to abuse less stringent regulations of developing States, thus attaining their nationality through incorporation, and receiving a sponsorship for activities in the Area. The SDC states, that the phenomenon could threaten the “uniform application of the highest standards of protection of the marine environment, the safe development of activities in the Area and protection of the common heritage of mankind.”¹⁷⁷ As stated earlier, the lack of proper definition of *compensable damage* is another forum shopping issue where contractors can select a jurisdiction with more lenient national regulations regarding liability and compensation.¹⁷⁸

However, developing States may enjoy a certain entitlement, that developing States cannot. As mentioned, contractors must locate their areas of interest that are sufficiently large and of sufficiently estimated commercial value, to allow two parallel mining operations, when the area is split in half. The other half becomes the reserved area, which is reserved for the DSM activities of the Enterprise and/or developing States.¹⁷⁹ The intention is to ensure their access

¹⁷⁴ UNCLOS, article 148.

¹⁷⁵ SDC 2011, paragraph 158.

¹⁷⁶ Hinrichs Oyarce 2018, p. 321.

¹⁷⁷ SDC 2011, paragraph 159.

¹⁷⁸ Svendsen 2020, p. 607-608.

¹⁷⁹ UNCLOS, annex III, article 8.

to sufficient seabed mineral resources but leaving the workload of finding these areas to the technically capable contractors.¹⁸⁰ The reserved areas have gained the interest of multiple contractors currently engaged in exploration of the seabed, as provided by UNCLOS.¹⁸¹ For example, currently there are seven mining contracts concerning PMN exploration in the reserved areas of the CCZ, of which four contracts are private corporations based in developing States, and three contracts are state enterprises.¹⁸² The SDC has noted that providing the sole rights of utilizing the reserved areas to developing States (second after Enterprise) are intended to supply developing States with an equal footing for participation in activities in the Area.¹⁸³

¹⁸⁰ Willaert 2021 (The Enterprise), p. 2.

¹⁸¹ UNCLOS, annex III, article 9, paragraph 4 (Activities in reserved areas).

¹⁸² Dingwall 2021, p. 191-192.

¹⁸³ SDC 2011, paragraph 163.

3. The liability regime of deep seabed mining

3.1. Responsibility, obligation, and liability

Sponsoring States and contractors are proactive participants of DSM. Both experience their own parallel responsibilities and obligations while being involved in the mutually initiated sponsorship-relationship. Primarily, these responsibilities and obligations are intended to ensure the uniform and predictable functioning of the legal framework that is built around the industry of DSM. Activities in the Area should occur, not only for the benefit of the contractor and the sponsoring State, but also for the benefit of the humankind. However, benefits should not overshadow the protection and preservation of the marine environment, and mitigation of damage. A breach of said responsibilities and failure to fulfil one's obligations entails liability. The SDC has explained this counter functionality. It comments that responsibility and obligation are both a primary obligation to perform in a certain manner, while liability is the consequence to a breach of the primary obligation.¹⁸⁴

The responsibilities and obligations for both the contractors and the sponsoring States are regulated through UNCLOS provisions, the Mining Code, as well as other instruments adopted by the ISA. Contractors receive even more specific instructions regarding their responsibilities and obligations through the mining contract. Based on an approved plan of work, it carefully considers and sets expectations upon the contractor.¹⁸⁵ Sponsoring States and contractors must undertake necessary measures during mining to ensure effective protection for the marine environment from the harmful effects.¹⁸⁶ For the contractor these measures include, but are not limited to, compliance with the plan of work¹⁸⁷; prevention, reduction and control of pollution and other hazards¹⁸⁸; restriction of the mining discharges¹⁸⁹; et cetera. As mentioned, failure to fulfil these obligations may result in the liability for the contractor. The contractor entails liability for all damage that arises out of the wrongful acts during mining activities.¹⁹⁰ A violation of a legal obligation is a wrongful act.¹⁹¹

¹⁸⁴ SDC 2011, paragraph 66.

¹⁸⁵ Feichtner 2020, p. 4-5.

¹⁸⁶ UNCLOS, article 145.

¹⁸⁷ DER, regulation 52 (Performance assessments of the Environmental Management and Monitoring Plan).

¹⁸⁸ DER, regulation 49 (Pollution control).

¹⁸⁹ DER, regulation 50 (Restriction of Mining Discharges).

¹⁹⁰ UNCLOS, annex III, article 22.

¹⁹¹ Feichtner, 2020, p. 4.

Meanwhile, sponsoring States have two different types of obligations: (1) their individual direct obligations; and (2) the obligations concerning the contractor's activities in the Area.¹⁹² Direct obligations concern different administrative matters and are fulfilled conceptually. These include the obligation to assist the Authority in the exercise of control over activities in the Area; the obligation to apply a precautionary approach; the obligation to apply best environmental practices; the obligation to take measures to ensure the provision of guarantees in the event of an emergency order by the Authority for protection of the marine environment; the obligation to ensure the availability to recourse for compensation in respect of damage caused by pollution; and the obligation to conduct environmental impact assessments.¹⁹³

The counterpart of direct obligations is the responsibility of the sponsoring States to actively ensure that contractors act in compliance with their responsibilities and obligations. Sponsoring States must also assist the ISA in ensuring said compliance.¹⁹⁴ In fact, as presented in previous chapters on sponsorships, the requirement of sponsorship verifies the determination of the State to secure compliance of a contractor. With that verification, the sponsoring State accepts responsibility for the contractor, because private entities are not bound by international legal instruments like sponsoring States are. It is envisaged, that contractor's compliance with its responsibilities and obligations should be enforced through the proactiveness of the sponsoring State and by applying its domestic legal system.¹⁹⁵

There are specific measures that the sponsoring State must undertake to ensure contractor compliance. Fortunately, the requirement does not expect a result, but rather functions as an obligation of conduct to practice due diligence. The SDC has characterized it as the obligation to "deploy adequate means, to exercise best possible efforts, to do the utmost, to obtain a result".¹⁹⁶ This requires adoption of reasonably appropriate rules and measures within the domestic legal system. The State must enforce these rules, and practice control and monitoring activities over the mining activities of contractors.¹⁹⁷

¹⁹² SDC 2011, paragraph 177.

¹⁹³ SDC 2011, paragraphs 121 & 122.

¹⁹⁴ UNCLOS, article 153, paragraph 4, and UNCLOS, article 139, paragraph 1.

¹⁹⁵ SDC 2011, paragraph 78.

¹⁹⁶ SDC 2011, paragraph 110.

¹⁹⁷ SDC 2011, paragraph 115, 118 & 120.

The due diligence standard is fulfilled if measures in the domestic legal system can provide sufficient evidence of being reasonably appropriate. This can be achieved by undertaking executive measures to conform to international obligations and by showing that domestic legislative acts and even the judiciary decisions are in conformity with international obligations.¹⁹⁸ UNCLOS states that “damage caused by the failure of a State Party or international organization to carry out its responsibilities under this Part shall entail liability”¹⁹⁹ In this context, responsibility is recognized, in general international law, as the secondary obligation to make reparations for damage that has been caused by the wrongful act.²⁰⁰ A failure to fulfil these obligations entails liability for the sponsoring State.²⁰¹

3.2. Attribution of liability to compensate

Compensability, logically, requires that there is someone to compensate. The responsibility to compensate damage is attributed to the party that is liable. When DSM activities cause damage, the liable party may be the contractor, the ISA, or the sponsoring State.²⁰² However, the legal framework for DSM doesn’t recognize strict liability, as fault-based liability is the standard for matters relating to DSM.²⁰³ The principle of strict liability originates from common law countries, where it entails liability without wrongdoing – where a party must compensate for damage irrespective of direct fault of that party.²⁰⁴ Therefore, attribution of liability, in the context of activities in the Area, requires the existence of material damage, which is a deviation from the customary international law.²⁰⁵ The principality certainly softens the evaluation of liability for liable party, but arguably, that vacuum for a punitive or cautionary element in the liability regime undermines the due diligence standard.

A consensus within international law states that compensation for environmental damage should reimburse the costs incurred by the suffering party. These costs may occur for any reasonable measures of assessment, reinstatement, or restoration of damaged or destroyed components of the environment. The primary intention is to restore the damaged environment

¹⁹⁸ Xu et al. 2023, p. 2-3.

¹⁹⁹ UNCLOS, article 139, paragraph 2.

²⁰⁰ ASR, article 31, paragraph 1.

²⁰¹ UNCLOS, article 139, paragraph 2.

²⁰² Craik 2018, p. 4.

²⁰³ SDC 2011, paragraph 189.

²⁰⁴ Goldberg & Zipursky 2016, p. 745

²⁰⁵ SDC 2011, paragraph. 178.

to its *status quo* or baseline condition. The secondary intention is reimbursing the financial losses of the suffering party. Furthermore, it's important that that the compensability of environmental damage is quantifiable, verifiable, and predictable. A justifiable valuation approach or methodology should be chosen to retain predictability of legal consequences.²⁰⁶

Another interesting topic in this regard concerns the potential liability gaps. These situations mean, that there are no legal obligations to compensate or when there are no funds to compensate. In summary, a liability gap may occur in three situations under the current liability regime. The first situation occurs when both the contractor and the sponsoring State have acted in accordance with their obligations, but for reasons beyond their control, damage occurs, in *force majeure* conditions for example. The second situation occurs when the sponsoring State has acted in accordance with its obligations, thus cannot be held liable to compensate, but the liable contractor is insolvent, or it's funds are hidden from the sponsoring State. The third situation is a combination with the second one, where the liable contractor's funds are unavailable, and the sponsoring State has failed to act in accordance with its obligations, but there is no causal connection between its failure and the damage. In this situation, there is no legal reason to pursue compensation from the sponsoring State.²⁰⁷

Remedies for liability gaps have been presented during the written and oral statements for the 2011 Advisory Opinion. For example, residual liability was proposed with differing opinions. Certain States and international organizations suggested an obligation for sponsoring States to cover the difference of the amount not reimbursed by the contractor.²⁰⁸ This was supported by the IUCN, arguing that leaving damage unremedied, because of the contractor's insolvency would be inequitable.²⁰⁹ In fact, the 2006 ILC Draft principles on the Allocation of Loss in the Case of Transboundary Harm Arising out of Hazardous Activities states that "[i]n the event that the measures under the preceding paragraphs are insufficient to provide adequate compensation, the State of origin should also ensure that additional financial resources are made available".²¹⁰ Support towards implementation of residual liability was also voiced by Greenpeace and WWF.²¹¹

²⁰⁶ Handl 2019, p. 607–608 & 614.

²⁰⁷ Rayfuse 2011, p. 484-485.

²⁰⁸ SDC 2011, paragraphs 202 & 203.

²⁰⁹ Tanaka 2013, p. 222.

²¹⁰ The 2006 ILC Draft principles on the Allocation of Loss in the Case of Transboundary Harm Arising out of Hazardous Activities, principle 4, paragraph 5.

²¹¹ Tanaka 2013, p. 222.

The SDC noted that application of residual liability is not feasible under the current liability regime, as the forms of liability for the sponsoring State and the contractor are parallel, but unconnected. They meant by this, that each are responsible to ensure their own obligations are fulfilled.²¹² The SDC also reminded that filling liability gaps by using customary international law is not feasible either.²¹³ Meanwhile, it was advised that ISA should establish a trust fund to compensate for damage that is not covered due to liability gaps.²¹⁴ Naturally, there may be situations where proof of fault cannot be acquired, or the connection between one's activities and compensable damage cannot be established. In these situations, the suffering party or the international community is left to endure the losses.²¹⁵ These situations would indeed require the hasty establishment of a trust fund.

²¹² SDC 2011, paragraph 204.

²¹³ SDC 2011, paragraph 209.

²¹⁴ SDC 2011, paragraph 205.

²¹⁵ Craik 2018, p. 5.

4. Potential damage in deep seabed mining

It is suitable to begin this chapter with a fitting quote by Benjamin N. Cardozo, who said that “Justice, though due to the accused, is due to the accuser also. The concept of fairness must not be strained till it is narrowed to a filament. We are to keep our balance true.”²¹⁶ As the exploitation phase stands at the opening gates, potentially the loudest voice of caution heard concerns the most likely event of a grave environmental damage. Environmental damage lacks a uniform definition, but they can be described as “any damage inflicted on the common goods of nature: natural habitats, species of flora and fauna, air, water, soil, aesthetic and cultural values”.²¹⁷ It is envisaged that damage should be compensated. But there is also the lack for proper definition of compensable damage. The mechanisms for determination and calculation of damage, and methods of enforcement of compensation are also vaguely provided within the legal framework. This chapter attempts to analyse and respond to the question of potential forms of damage, that may occur and can be evaluated within the compensation regime of the Area.

The SDC contemplated the concept of compensable damage, in connection to activities in the Area. It argued that damage to the Area and its resources that are part of the CHM, as well as the damage to the marine environment, are compensable.²¹⁸ Notably, SDC separated the category of Area and its resources from the category of marine environment, which suggests that these categories should be treated separately. However, practical separation of these concepts is difficult since both the Area and its mineral resources are physically inseparable from the marine environment. It is therefore logical to argue that damage to any of said elements would also damage the other as a corollary effect.²¹⁹

To further elaborate the meanings given by the SDC, in 2018, the LWG on Liability produced a synthesized list regarding damage resulting from the DSM activities in the Area, based upon research in the available regulations and customary laws. In accordance with that research, it was said that compensable damage would be: damage to the marine environment of the Area, including its living resources; damage to the Area and its resources constituting the CHM;

²¹⁶ Benjamin Nathan Cardozo, was an American lawyer in late 1800s to early 1900s, having great influence on the American common law system by influencing the American appellate judging toward greater involvement of public policy and modernization (Britannica 2023, “Benjamin Nathan Cardozo”).

²¹⁷ Maulida 2021, p. 6.

²¹⁸ SDC 2011, paragraph 179.

²¹⁹ Mackenzie 2019, p 15.

damage to living resources in the water column above the Area; damage to persons and property, which include losses arising as a consequence of environmental damage; and damage to the marine environment and natural resources in areas within national jurisdiction.²²⁰

4.1. Damage to the marine environment of the Area, including its living resources

Damage to the marine environment of the Area, including its living resources, is one of the categories of damage that is envisaged to be compensable. Previously it has been introduced that UNCLOS designates the Area as the seabed and ocean floor and subsoil thereof, which are all located in the ABNJ.²²¹ However, while the marine environment is not explicitly defined in UNCLOS, its preservation and protection still plays a pivotal role throughout the UNCLOS text. For example, to ensure effective protection of the marine environment from the harmful effects of mining, UNCLOS requires necessary measures to be taken by all active parties, and to achieve this intention the ISA is required to adopt appropriate rules, regulations, and procedures.²²² UNCLOS expects all participants to fulfil their respective obligations.

UNCLOS Part XII contains detailed provisions regarding the protection and preservation of the marine environment. Based on that content, the definition of marine environment should be understood quite broadly, since it considers most potential sources of damage. Even damage occurring in connection to DSM. In Part XII, UNCLOS states, that for the protection and preservation of the marine environment, necessary measures must include those that protect and preserve rare or fragile ecosystems as well as the habitat of depleted, threatened, or endangered species and other forms of marine life.²²³

In the Mining Code, the definition of the marine environment is included, but it does not attempt to provide an exhaustive list of the considerable elements that should be evaluated in that context, rather providing a mechanism for developing standards to aid the practical protection and preservation measures. The Mining Code states that marine environment “includes the physical, chemical, geological and biological components, conditions and factors which interact and determine the productivity, state, condition and quality of the marine ecosystem, the waters

²²⁰ LWG on Liability 2018, p 19.

²²¹ UNCLOS, article 1, paragraph 1(1)

²²² UNCLOS, article 145 (Protection of the marine environment)

²²³ UNCLOS, article 194, paragraph 5. (Measures to prevent, reduce and control pollution of the marine environment).

of the seas and oceans and the airspace above those waters, as well as the seabed and ocean floor and subsoil thereof”.²²⁴ It could be argued that the definition intends to render the understanding of the marine environment almost as an all-encompassing category. It considers not only the current state of the marine environment, but also its capabilities to adapt and continue to function. For example, under that definition, elements such as biodiversity of a certain habitat would be evaluated. These some elements can be measured using genetics and taxonomy, it is possible to research copulation and migration of individuals and their populations.²²⁵

LWG decided to mention living resources separately, giving it a special focus, even if living resources are inherently included in the definition of marine environment as is.²²⁶ It could be argued that the special mention intended to promote especial consideration towards living resources such as plants, animals, and micro-organisms. Living resources may be utilized and can be attached with value (monetary or non-monetary) in a practical setting. Such living resources may include fisheries or marine genetic resources.²²⁷ Meanwhile, living resources are not particularly defined in UNCLOS. It defines resources as “all solid, liquid or gaseous mineral resources in situ in the Area at or beneath the seabed, including polymetallic nodules.”²²⁸ Living resources are absent in this definition, but their protection is one of the central themes of the legal framework. A significant differentiation between non-living and living resources is their location. Living resources are concerned in the context of the whole marine environment which constitutes not only the seabed and beneath it, but also the water column and the airspace above it.²²⁹

The DER includes a reference to genetic components of the marine ecosystem, to which it refers to as genetic resources. They can be regarded as a part of the marine environment, but also as natural resources of actual or potential value.²³⁰ The marine environment contains rich biological diversity, with a selection of potential applications from scientific research to development of new commercial products. These include pharmaceutical, agricultural, biotech

²²⁴ CFC Regulations, regulation 1, paragraph 3(d); PMN Regulations, regulation 1, paragraph 3(c); and PMS Regulations, regulation 1, paragraph 3(c); DER, schedule (Use of Terms and Scope). “Marine Environment”. The definition is verbatim in all of the aforementioned Regulations.

²²⁵ Paulus 2021, p. 1.

²²⁶ LWG 2018, p 19.

²²⁷ Davenport 2019, p 16.

²²⁸ UNCLOS, article 133 (a) (Use of Terms).

²²⁹ CFC Regulations, regulation 1, paragraph 3(d); PMN Regulations, regulation 1, paragraph 3(c); and PMS Regulations, regulation 1, paragraph 3(c); DER, schedule (Use of Terms and Scope).

²³⁰ Mackenzie 2019, p 15.

and cosmetic products. Legal definitions of genetic resources envisage different biological material, such as whole organisms, material from deep-sea animals, microbes or other organisms, genes, proteins, naturally produced chemicals, and parts thereof containing functional units with actual or potential value.²³¹ The logical assumption is that there will be widespread impacts on biodiversity to some extent, when the exploitation phase of DSM initiates. The heavy mineral harvesting machines not only scrape the seabed, but also remove the habitat of various seabed species. The suspension of large amounts of sediment plumes is suspected to impact biodiversity and expose organisms to toxic substances and otherwise disrupt normal lifecycles, as well.²³²

Finally, while not of high importance but still interesting, it must be noted that living resources of the Area are a distinct category from the living resources of the water column. Supposedly, there's currently an unimaginable variety of different species residing directly on the seabed and beneath the seabed, in the subsoil and sediments. Presumably, for that reason the LWG decided to view the category of living resources separately.

4.2. Damage to the Area and its resources constituting the CHM

In accordance with UNCLOS Part XI, the principle of CHM has been at the forefront of approaches towards the ABNJ. It encompasses those values that are important to activate participation and provide benefits to the whole humankind. UNCLOS designates the Area as the seabed and ocean floor and subsoil thereof, which are all located in the ABNJ.²³³ Resources in it are “all solid, liquid or gaseous mineral resources in situ in the Area at or beneath the seabed, including polymetallic nodules.”²³⁴ Both the Area and its resources are a part of the CHM.²³⁵

CHM has been imagined since the 1960s as the guiding concept for exploitation and sharing of resources of the deep seabed and the outer space. It was introduced for the first time by a Maltese Ambassador, Arvid Pardo, at the United Nations General Assembly (UNGA) in 1967. It was originally planned to provide the opportunity to all states, not just the developed ones, to

²³¹ Harden-Davies 2017, p. 504-505.

²³² Paulus 2021, p. 10.

²³³ UNCLOS, article 1, paragraph 1(1).

²³⁴ UNCLOS, article 133 (a) (Use of Terms).

²³⁵ UNCLOS, article 136.

profit from the vast riches of the seabed.²³⁶ The principle of CHM concerns the governance over the Area.²³⁷ It encompasses five significant aspects by which the Area must be governed: (i) non-appropriation of the Area or its resources by any State; (ii) common management of the Area through a singular administrative organ (ISA); (iii) sharing of profits with the international community, keeping in mind the preferential treatment of the developing States; (iv) use of Area for peaceful purposes only; and (v) preservation of the Area and its resources for future generations.²³⁸ As the contiguous water column belongs under the umbrella of freedom of the seas, due regard to other legitimate uses of the sea must be given during activities in the Area.²³⁹

The principle of CHM applies exclusively in relation to the regulation and management of the resources in the Area (seabed and subsoil thereof), seemingly excluding those of the subjacent water column.²⁴⁰ It is understood that solid resources include PMNs, PMSs and CFCs. Most common liquid mineral resources that are extracted from the beneath the seabed sediments are non-renewable fossil fuels, such as oil, natural gas, and methane hydrates.²⁴¹ Common gaseous mineral resources include non-methane alkanes such as ethane, propane, and butane.²⁴²

There have been proposals by developing States, to include marine genetic resources (MGRs) to the principle of CHM as well. However, developed States argue against this, and see fit to place MGRs under the umbrella of freedom of the high seas, in accordance with UNCLOS Part VII, making MGRs freely available to everyone.²⁴³ The position of developing States is understandable, as MGRs have a high value for scientific discoveries that provide services for the global well-being. Industries such as pharmaceuticals have an immeasurable value, especially for developing States.²⁴⁴ The importance would be the legal regime, under which MGRs would be placed. EU has prompted to avoid neither point of view to avoid political debate but has vouched for incorporation of access and benefit sharing for everyone.²⁴⁵ The current conditions lead to the logical assumption that MGRs are unlikely to be placed under the principle of CHM. However, matters relating to MGRs are prevalent in the recently adopted

²³⁶ Baslar 2016, p. 1.

²³⁷ Bourrel et al. 2018, p. 312.

²³⁸ Jaeckel 2020 (Benefitting from the Common Heritage of Humankind), p 663.

²³⁹ Bourrel et al. 2018, p. 311-312.

²⁴⁰ Ibid.

²⁴¹ NOAA Ocean Exploration -website, "Lesson 11: Energy from the Oceans".

²⁴² Singh et al. 2017, "abstract".

²⁴³ Henriksen 2022, p. 95.

²⁴⁴ Arnaud-Haond 2020, p. 30–31.

²⁴⁵ Davenport 2019, p 16.

Agreement under the United Nations Convention on the Law of the Sea on the Conservation and Sustainable Use of Marine Biological Diversity of Areas beyond National Jurisdiction (BBNJ “Agreement”). The agreement includes both principles of CHM and freedom of the high seas as guiding principles for parties to follow.²⁴⁶

In the context of calculation of compensable damage, the constituting elements of CHM such as non-appropriation, common management, sharing of benefits and preservation for future generations, become relevant.²⁴⁷ The significance of CHM in this context arises from the principality of the common ownership or belonging of the Area and its resources to the humankind, which renders any damage to these properties as damage to the interests of all. Every State Party not only has an interest, but an obligation to see that the Area and its resources are preserved and protected, when activities are carried out under their jurisdictional powers of effective control or nationality.²⁴⁸ In the Belgium vs. Spain case, the ICJ drew an essential distinction between obligations owed to specific states and those owed towards the whole international community. The Court emphasized the importance of the rights of all States, being able to claim a legal interest in the enforcement of obligations that are owed towards everyone. Therefore, all States have a right of claim damages for the breach of *erga omnes* obligations.²⁴⁹

Erga omnes was defined by the Institut de droit international as “(a) an obligation under general international law that a State owes in any given case to the international community, in view of its common values and its concern for compliance, so that a breach of that obligations enables all States to take action; or (b) an obligation under a multilateral treaty that a State party to the treaty owes in any given case to all the other States parties to the same treaty, in view of their common values and concern for compliance, so that a breach of that obligation enables all these State to take action.”²⁵⁰ These other possible claimants can be referred to as “not directly injured states”. These States have not suffered damage, but it is considered that their rights have been breached.²⁵¹

It’s interesting to note that legal texts do not include marine environment in the definition of CHM. However, in practice, marine environment is invertedly connected to CHM, because the

²⁴⁶ BBNJ agreement, article 7.

²⁴⁷ Jaeckel 2020 (Benefitting from the Common Heritage of Humankind), p. 663.

²⁴⁸ UNCLOS, article 139, paragraph 1.

²⁴⁹ Tanaka 2013, p. 225.

²⁵⁰ Institut de droit international 2005, article 1.

²⁵¹ Tanaka 2013, p. 224.

latter CHM envisages intergenerational equity, implying the transmission of natural resources to future generations. Damage to the marine environment as well as failure to provide compensation for that damage would conflict with the principle of this equity.²⁵²

4.3. Damage to living resources in the water column above the Area

The water column is the body of water between the seabed and the surface of the ocean. Meanwhile the deep-sea water column is considered as the body of water 200 meters below surface.²⁵³ The water column is considered to be a part of the marine environment, as its evident by the definition in the Mining Code.²⁵⁴ DSM activities are envisaged to cause environmental impacts to the water column. One of the largest potential issues for exploitation phase are the sediment plumes of fine particles. These are stirred up and suspended over large areas by the mining harvesting machines. Moreover, the slurry, that is transported through pumps and tubes to the surface support ships, is dewatered, and returned to the sea. This is called a discharge plume, which can disperse unpredictably and turbulently.²⁵⁵

These increases of turbidity cause impacts on biogeochemical properties of the water column, resulting in the burying and smothering of fauna, as well as potential release of toxic substances. Resulting decrease in faunal abundance is estimated to last from months to several years.²⁵⁶ In general, there are different estimations on dispersion of sediment plumes. Some reports evaluate the area of dispersion to be hundreds of kilometres, while others envisage less than a 10-kilometre area. Other potential environmental impacts in the water column are noise and light pollution from the mining machinery and surface vessels. Furthermore, electromagnetic disturbances, and risks of leaks and spills of other toxic substances are prevalent.²⁵⁷

Living resources are categorised as plants, animals, and micro-organisms. These may potentially suffer environmental impacts due to impacts in the water column. Deep-sea ecosystems are built on steady environmental conditions but are still connected with the ecosystems of the water column to fulfil their low level of nutritional needs. These ecosystems

²⁵² Davenport 2019, p 14-15.

²⁵³ Cuyvers et al. 2018, p. viii (summary) & p. 1.

²⁵⁴ CFC Regulations, regulation 1, paragraph 3(d); PMN Regulations, regulation 1, paragraph 3(c); and PMS Regulations, regulation 1, paragraph 3(c); DER, schedule (Use of Terms and Scope). "Marine Environment".

²⁵⁵ MIDAS, brief.

²⁵⁶ McQuaid 2020, p. 27–28 & 31.

²⁵⁷ Cuyvers et al. 2018, p. 63–64.

are also enriched and diversified by deep ocean circulation, topography and hydrothermalism.²⁵⁸ Different pelagic fisheries and marine mammals as well as benthic invertebrates are some of the risk groups of animals.²⁵⁹ As to fisheries for example, the cumulative impacts of DSM on fisheries have been discussed thoroughly in many sources. It has been argued that DSM could negatively impact global fisheries where over 50 percent of stocks are claimed to have been fished at their maximum limit, and over 35 percent of stocks are either overfished, depleted, or recovering.²⁶⁰

Fisheries could face new stressors such as noise pollution, heavy metal pollution, and large sediment plumes being secreted from the treatment of minerals. Fisheries are already endangered by climate change, but continue to provide revenue, nutrition, employment, and livelihoods of the Pacific Island communities. Specifically, tuna fisheries overlap with the DSM concentrated areas and account for up to 84 percent of the GDP for the tuna independent Pacific small island states.²⁶¹ Pacific islands' coastal fishing is intended for artisanal and subsistence purposes, creating a supply for their domestic markets, but also the deep-water bottom fisheries are highly export oriented. An estimated 25 – 30 percent of the global canned tuna is caught in the west and central Pacific Ocean with a value of around US\$4.5 billion generated annually.²⁶²

4.4. Damage to persons and property, which include losses arising as a consequence of environmental damage

As discussed, there are many forms of negative environmental effects that may occur in connection to activities in the Area, especially during the exploitation phase. The potential for damage has many implications for the environment and for private interests. Considering the nature of the marine environment, damage has the potential to spread quite rapidly on a large spatial scale.²⁶³ For example, commentary on the ILC Articles on Prevention of Transboundary Harm from Hazardous Activities acknowledges environmental harm having more broad effects than merely direct ones that concern the specific spot where mining is being conducted. For

²⁵⁸ Tilot et al. 2021, p. 4. Hydrothermalism is a deep-sea process that effects the composition and the heat levels of the oceanic lithosphere and seawater, and it occurs when heat and chemicals are transferred between the ocean and the earth's crust (Jamieson et al. 2016, *Hydrothermalism*).

²⁵⁹ Cuyvers et al. 2018, p. 63-64.

²⁶⁰ Jaeckel et al. 2023, p 1.

²⁶¹ Ibid.

²⁶² Tilot et al. 2021, p. 4.

²⁶³ Haeckel et al. 2020, p. 336.

example, recognized direct effects of mining may have a quantifiable indirect effect on human health, industry, property, environment, or agriculture in other States.²⁶⁴

There is a variety of parties that could suffer direct damage to property or persons, such as contractors, shipowners, marine scientific researchers and research institutions, fishing companies, genetic resource exploiters, cable owners, vessel crews, owners of operators of installations and artificial island, State Parties (including flag states), and non-state parties. The variety of potential incidences and effects are unimaginable. For example, while the ownership of fisheries cannot be claimed by any party, it can be argued that the loss of fisheries could possibly impact fishermen and fishing companies, fish vendees and regional fishing management organizations, and coastal fishing communities.²⁶⁵ The exclusion zones around the exploitation zones may also reduce access to fishing areas and cause a change in navigational routes, which could have an impact also on different actors in the maritime logistics chain.²⁶⁶

The mining allocated sites are an interesting topic in this regard, as situations may occur where a sediment plume may spread outside a contractor's allocated contract area, disrupting another contractor's mining activities.²⁶⁷ Another situation may occur due to a miscommunication during the planning phases, where an underwater object, such as a submarine cable goes unnoticed in the allocated mining site, and gets damaged by the mining machinery. Approximately 98 percent of global telecommunications are handled with submarine fibre optic cables, and there are power cables, scientific cables, and military cables, laid in the world oceans at a total combined length of around 1,6 million kilometres. It is envisaged that the costs of damage resulting from mining activities would be significant for both the contractors and the cable providers.²⁶⁸ The DER recognizes the possibility for such damage to a submarine cable or pipeline, or any installation, and refers to these situations as *incidents*.²⁶⁹

²⁶⁴ Voigt 2021, p 9.

²⁶⁵ Davenport 2019, p 16–17.

²⁶⁶ Miller et al. 2018, p. 17.

²⁶⁷ Ibid.

²⁶⁸ ISA 2015, p. 9, 17 & 22.

²⁶⁹ DER, schedule (Use of Terms and Scope), “Incident” (c).

4.5. Damage to the marine environment and natural resources outside the Area

Damage to the marine environment and natural resources outside the Area in this context concerns damage to the areas within national jurisdiction (AWNJ), i.e. to areas of coastal States. In the situation where activities in the Area cause a negative environmental effect, these effects may be extended to AWNJs. An effect like this could be a sediment plume on the run, that causes damage to the marine environment and the natural resources in the AWNJ. Such damage may render the use of certain area impossible for an unexpected period and prevents access to natural resources.²⁷⁰ These resources may include both non-living and living resources. For example, the ecosystems of the Pacific Island states contain vital ecosystem services and produce societal benefits not only for the local people, but also to the global public, due to the migration patterns of multiple marine species. Migration of mammal species, such as whales is important not only for cultural values of the people in the Pacific region, but also for touristic purposes, such as the activity of whale watching.²⁷¹

Furthermore, the special consideration for coastal state rights are evident from the DER as it states that “Contractors shall take all measures necessary to ensure that their activities are conducted so as not to cause Serious Harm to the Marine Environment, including, but not restricted to, pollution, under the jurisdiction or sovereignty of coastal States, and that such Serious Harm or pollution arising from Incidents in their Contract Area does not spread into areas under the jurisdiction or sovereignty of a coastal State.”²⁷²

4.6. Compensables

A few comparisons and categorisations can be drawn and speculated, based on the syntheses above, to aid differentiation between the potential compensable damage and their evaluation during determination of liability, both within the national and international scene. Different categories of damage are presented and evaluated, which help understand the linguistic approaches and the interwoven elements of different international legal sources and precedents.

²⁷⁰ Drazen et al. 2020,

²⁷¹ Tilot et al. 2021, p. 4.

²⁷² DER, regulation 4, paragraph 2 (Protection measures in respect of coastal States).

Firstly, it is indicated that damage can be understood to be direct or indirect. Certain activities may cause direct damage to the seabed and the water column, but damage may occur elsewhere as well. For example, a loss of fisheries may cause a shortage for a local fishing community that is dependent on fishing. This example envisages both direct damage to the fisheries, but also indirect damage as loss of income or rations for the fishing community. However, it must be evaluated, how far does the liability extend from the original cause of damage. Liability for any remote or peripheral damage that extends far from the original cause would fragment the objectives of determination of compensable damage. The limiting factor in this case is proof of causation. This observation is to be determined further by an international court or a tribunal.

Secondly, environmental damage often entails both material and immaterial aspects, including ecological disruptions or social impacts on individuals and whole communities.²⁷³ For example, loss of fisheries may also hurt the cultural values of certain local communities and indigenous people, which could be considered as damage towards moral values.²⁷⁴ ASR prescribes that the State responsible for damage must make full reparation for the damage caused by the internationally wrongful act, whether its material or moral (immaterial).²⁷⁵

Material damage pertains damage to property, or to other interests that are possible to be calculated in financial terms and may be compensated, rather than satisfied or restituted, or awarded as punitive damages.²⁷⁶ However, liability in every case is considered only for the actual amount of damage.²⁷⁷ SDC has noted that the provision only mentions contractors and the ISA, but that such liability for the actual amount of damage should be understood to concern the sponsoring States as well.²⁷⁸ As reimbursement only concerns actual amount of damage, assertion of punitive damages becomes unfeasible. The suffered party cannot expect financial gain from the harm caused.²⁷⁹

Meanwhile, immaterial damage is considerably harder to define. It could be argued that there are forms of damage to private persons as well as whole communities, in a way that diminishes their personal feelings and pride. For example, internationally, personal injuries have been

²⁷³ Voigt 2021, p 8–9.

²⁷⁴ Tilot et al. 2021, p. 2.

²⁷⁵ ASR, article 31.

²⁷⁶ ASR, articles 34, 35, 36, and 37.

²⁷⁷ UNCLOS, annex III, article 22.

²⁷⁸ SDC 2011, paragraph 193.

²⁷⁹ 2006 ILC Draft principles on the Allocation of Loss in the Case of Transboundary Harm Arising out of Hazardous Activities, commentary to principle 3, paragraph 17.

compensated through different human rights bodies (such as the European Court of Human Rights) where compensation has been awarded for both material (loss of earnings, pensions, medical expenses, etc.), and immaterial losses (pain, mental issues, diminished quality of life, etc.) that are quantifiable using equitable assessment.²⁸⁰ Similarly, the example of lost fisheries works perfectly here, as many of the local coastal state communities and indigenous peoples with rich maritime cultures could suffer significantly, as their human well-being and sustainable livelihoods would be affected.²⁸¹ The seabed is also seen as a source of cultural heritage, for example, to the African diasporic has a role in the cultural memory of the transatlantic slave trade.²⁸²

Furthermore, damage to the Area constitute damage to the CHM, which could be argued being damage to immaterial interests. Damage to the CHM could, in principle, be claimed by a States that have not suffered damage, but it can be considered that their rights have been breached.²⁸³ Here, *erga omnes* claims should be considered, where UNCLOS State Parties can bring a claim regarding the Area and its resources.²⁸⁴ The entitlement to demand for liability of another State for a breach of an obligation is provided to another State than an injured State, but this requires that (a) “The obligation breached is owed to a group of States including that State, and is established for the protection of a collective interest if the group; or (b) the obligation breached is owed to the international community as a whole.”²⁸⁵

In the *Belgium v. Spain* case, the ICJ stated that States have a legal interest to fulfil their obligations towards the international community as a whole, as these are *erga omnes* obligations.²⁸⁶ UNCLOS does not contain an explicit provision for the ISA to make claims for damage either, but it is prescribed to act on behalf of mankind, and therefore such right to make claims for the whole humankind is permitted.²⁸⁷ However, *erga omnes* claimants would not be able to receive the compensation directly, as receiving compensation without suffering damage would amount to a kind of undue profit, and the compensation for damage *erga omnes* would be directed to the compensation fund established by the ISA.²⁸⁸

²⁸⁰ Voigt 2021, p 9. Equitable assessment evaluates various different parameters using previously acquired statistics and data.

²⁸¹ Tilot et al. 2021, p. 2.

²⁸² Jaeckel et al. 2023 npj. p. 1.

²⁸³ Tanaka 2013, p. 224.

²⁸⁴ Davenport 2019 (Paper No. 5), p. 14–15.

²⁸⁵ ASR, article 48.

²⁸⁶ *Belgium v. Spain* case, 1970 Judgement, paragraph 33.

²⁸⁷ UNCLOS, article 137, paragraph 2.

²⁸⁸ Tanaka 2013, p. 227

The idea of material and immaterial damage connects to the third observation. When damage occurs to private subjective interests, it also entails reimbursement of those interests. But can damage to the environment itself be reimbursed or compensated? The potential forms of a subjective interest could be: the loss (of profit) or damage by impairment of the marine environment; costs of reasonable measures to restore or reinstate the original condition of the marine environment, including its natural resources; reasonable measures to restore the equivalent of destroyed or damaged components back to the marine environment; reasonable costs of assessing and monitoring the impairment of the marine environment; costs of reasonable preventive or response measures; and other compensatory response measures.²⁸⁹ The costs to subjective interests usually adhere to exact calculations, making claims for monetary losses possible for the wronged party. However, to consider the preservation of value of the environment for local communities, as well as for humankind as a whole, it would be logical to consider the collective interests of the international community in terms of pure environmental loss.²⁹⁰

Pure environmental loss has not been properly defined. It is not evident how notional or non-market-based value of damaged resources, such as extinction of endangered wildlife, could be quantifiable.²⁹¹ The ICJ explicitly accepted the compensability of (pure) environmental damage in its judgement on the *Costa Rica v. Nicaragua* case.²⁹² Nicaragua was ordered to provide compensation to Costa Rica for environmental damage, which occurred from Nicaragua's dredging and construction activities in a canal connected to the Colorado River of Costa Rica. Costa Rican representatives argued that such activities risked the flow of water to the Colorado River, which would cause damage to Costa Rican wetlands and national wildlife protected areas in the region. The ICJ affirmed the consistency of the principles of international law regarding consequences of internationally wrongful acts. The principles state that compensation is due for damage caused to the environment, in and of itself, in addition to expenses incurred by an injured State.²⁹³ That phrase "in and of itself" is interpreted to mean that damage to the environment itself can be compensable, and that environment holds intrinsic value.²⁹⁴ The ILC has also recognized probable damage towards environmental values, including biodiversity,

²⁸⁹ Mackenzie 2019, p 13.

²⁹⁰ Davenport 2019, p 14-15.

²⁹¹ Fitzmaurice 2023.

²⁹² Tanaka 2021, p. 257.

²⁹³ *Costa Rica v. Nicaragua* case, 2018 Judgement, paragraphs 39-43.

²⁹⁴ Kindji & Faure 2019, p. 31-32.

amenity, “non-use values”, et cetera. Damage to environmental values, despite being difficult to quantify, should be no less real or compensable than damage to material property.²⁹⁵

A clear example pure environmental losses is known as damage to ecosystem services, or in other words, benefits that people draw from the environment. The marine environment provides numerous of vital ecosystem services for the local communities as well as the whole planet. There are four categories of ecosystem services: (1) provisions (food, water, timber, fiber), (2) environment regulation (climate, flood, disease, waste, water quality), (3) culture (recreation, aesthetics and spiritual benefits), and (4) supporting services (soil, photosynthesis and nutrient cycling), in accordance with the Millenium Ecosystem Assessment.²⁹⁶ An example of the environmental regulation is the ability of the marine environment to absorb carbon dioxide. In fact, marine environment is responsible of absorbing 30 percent of global carbon dioxide, acting as a carbon sink. Meanwhile, marine phytoplankton generates 50 percent of the global oxygen.²⁹⁷ Even a layman can recognize this as a valuable global asset.

However, while these damaged ecosystem services may be recognized as a pure environmental loss, the mechanisms to evaluate such damage remain unclear and unsusceptible to available monetary measurements. Costa Rica v. Nicaragua case also included ecosystem services under the umbrella of environmental damage to which compensation was to be provided. Similarly, in another context, during the UNCC report (S/AC.26/2005/10) regarding Iraq’s invasion of Kuwait, compensation of non-economic loss due to environmental damage was also deemed valid for proper assertion of international law. The report considered health related effects of the armed conflict, such as PTSD, exposure to air pollution and loss of general well-being. The panel considered that while there was the absence of coherent legal instructions in international law to evaluate damage, the panel saw itself entitled and required to evaluate damage and determine appropriate compensation based on general principles.²⁹⁸ However, problemacy occurs with the difficulty to determine adequate measures to reimburse and repair the damage.

Situations that don’t allow application of adequate measures of reinstatement or restoration or introduction of equivalent components, to restore the *status quo* of the damaged area, necessitate the incorporation of the pure environmental loss as compensable damage, being

²⁹⁵ Fitzmaurice 2023.

²⁹⁶ Kindji & Faure 2019, p. 15.

²⁹⁷ Herman 2016, p. 7.

²⁹⁸ S/AC.26/2005/10, paragraph II.

essentially non-economic in nature.²⁹⁹ Such incorporation has been argued against (for example, in the oil pollution regime) because evaluation of pure environmental damage requires difficult measures, such as theoretical models.³⁰⁰ Evaluation of compensation for pure environmental damage is never non-economic either, as the contemplation focuses on anthropocentric aspects of evaluating the value of the damaged resources to human welfare. Therefore, it is argued that recognition of pure environmental damage and calculation of its own intrinsic value is not possible, despite the attempt of international law to review the value objectively.³⁰¹ This latter opinion, under the contemporary view, feels more practical.

However, it can be proposed that certain economic value could be given to the environment, despite its repair costs exceeding the estimated profits of any mining contractor or nation State. What can be concluded from this, is that the Area is a part of the principle of CHM and, therefore, the compensation for damage would be owed to the humankind as a whole. Meanwhile, the ISA acts on behalf of the humankind and as its representative. If pure environmental loss is claimed through the belonging of the damaged Area to the whole humankind, then compensation could be made available to the compensation fund, of which the establishment has been urged by many interested parties.

The amount of compensation is also a requirement to be established. While the potential amount of liability is stated as “actual amount of damage”, certain mechanism to calculate this “actual amount” needs to be created within the international legal framework to ensure uniform application of compensation rules. This mechanism has to be reasonably justifiable and be approved by all ISA members, through a public participation procedure, that avoids decision making behind closed doors. Furthermore, it should consist of saving clauses or other forms of limitations, to consider the realistic potential for reimbursement. The intention should not be complete economic annihilation of the contractor or the sponsoring State, but to fulfil the objective of repairing or restoring the damaged resource or environmental element.

²⁹⁹ Davenport 2019, p. 13-14.

³⁰⁰ Mackenzie 2019, p. 3-4.

³⁰¹ Kindji & Faure 2019, p. 31-32.

5. Thresholds of damage in deep seabed mining

5.1. Definition of thresholds

A threshold is defined as a level, point, or value above which something is true or will take place, or below which something is not true or will not take place.³⁰² Threshold is also defined as an amount, level, or limit of a measured indicator, that is created and used to help avoid unwanted change. In connection to environmental matters, thresholds indicate the limits, crossing of which will produce harmful or unsafe effects to the environment. They are commonly used to aid preventive actions before such effects occur. When determining thresholds, benefits of certain actions are compared and balanced against the detriment that they cause, based on scientific evidence, which may change over time.³⁰³ An economic perspective of determining the threshold of harm is to utilize comparison between the socio-economic utility of an activity with consideration towards its detrimental effects on the environment.³⁰⁴

In the practical setting, consideration of thresholds is imperative in three situations: during the consideration of plans of work, prevention of damage, and identification of damage, in connection to DSM activities.³⁰⁵ The potential extend of damage and the proper thresholds have not been uniformly established under the UNCLOS legal regime, as evidenced by the research in this paper. Establishment of proper thresholds or a synthesised systems of mechanisms for recognition of damage should be established for the exploitation phase of DSM activities. This will not only be important for the actors in the Area, but for the international courts and tribunals in their judicial practice. Since exploitation phase of DSM is yet to begin, this subject lacks scientific and practical certainties that have been recorded during hundreds of years of terrestrial mining.

It is expected, with some certainty, that exploitation activities will produce a certain level of environmental effects, depending on the targeted form of mineral resources and the geological area of mining. It is impossible to achieve a “no net loss” of biodiversity, as industrial-scale remediation of the marine environment has not been developed.³⁰⁶ But ecosystems are not just

³⁰² Merriam-Webster Dictionary “Threshold.”.

³⁰³ Hitchin et al. 2023, p. 1.

³⁰⁴ Kindji & Faure 2019, p. 13.

³⁰⁵ See chapter 5.2.

³⁰⁶ Kung et al. 2021, p. 2.

fragile, as there's also an expectation that marine ecosystems have a certain extent of rigidity and durability to cope and regenerate after the negative environmental effects predisposed by DSM missions. Exceeding these limitations would surpass the thresholds of damage, and this is the sweet spot how damage would be determined. These thresholds act as indicators and are referred to as ecological thresholds.³⁰⁷

An ecological threshold can be described as the point when an important ecosystem property or phenomenon have gone through a significant adverse change, exceeding the normal ranges of variability after which even a minor alteration may provoke a large ecosystem response.³⁰⁸ Ecological thresholds can therefore be considered as “tipping points” after which the ecosystem is unable to recover autonomously.³⁰⁹ It's easier to describe them as natural thresholds, as the set rules around them rely on factual ecological occurrences, rather than on prognosis or theoretical calculations. However, ecological thresholds require decades worth of long-term data regarding average baseline conditions and natural ecological variability, which the current DSM community substantially lacks. The research of natural variability requires a duration of 3-25 years. The data which may be used as threshold indicators concerns biodiversity, abundance, habitat quality, population connectivity, heterogeneity levels, and community productivity.³¹⁰ Ecological thresholds will be the main focus of this research.

Another type of management threshold may also be presented. These can be referred to as action thresholds – a term typically used in pest management of crops.³¹¹ These thresholds do not function as indicators of damage, but as pre-emptive warning in accordance with the principle of precautionary approach. The principle promotes certain action needs to be undertaken if certain negative environmental signs appear or the ecosystem is close to its limitations. It envisages a reaction to a risk that has been reliably calculated or measured.³¹² Potential risks are calculated with different models and variables to indicate specific threshold levels for different forms of negative effects, caused by certain activities or cumulative effects. Thresholds may then be used to indicate different points, crossing of which certain pre-emptive action should be undertaken to mitigate damage.³¹³ An example of such multilevel thresholds can be found in the New Zealand Fisheries Harvest Strategies, where certain measurement of

³⁰⁷ Ibid.

³⁰⁸ Levin et al. 2016, p 248.

³⁰⁹ Hitchin et al. 2023, p. 2.

³¹⁰ Levin et al. 2016, p 248

³¹¹ Wilen et al.

³¹² Durden et al. 2017, p. 195.

³¹³ Hitchin et al. 2023, p. 6.

fisheries' stock size and their productivity are used as a basis for managing the fishing activities.³¹⁴ A similar type of threshold evaluation is argued for the legal framework of DSM as well.³¹⁵ The pre-emptive action could envisage temporary or even permanent discontinuation of activities, or integration of certain measures to minimize or balance the negative effects.³¹⁶

Determination of concrete thresholds seeks to prevent such consequences from emerging by presenting a clear framework to implement into plans of work. However, it is important to have thresholds in place in the legal system as well, to prepare a response to emerging environmental threats.³¹⁷ When considering thresholds, the understanding of proper causes are also important. The UNCLOS legal regime specifies certain activities to possess damaging qualities or cautions of the missteps that would lead to damage automatically. This chapter focuses on researching the legal framework for established thresholds, and for mechanisms to establish thresholds, aiding the determination of compensable damage.

5.2. Relevance of thresholds in three situations

As mentioned, consideration of thresholds is most relevant during three situations, that may be encountered in connection to DSM missions: during the consideration of plans of work, prevention of damage, and identification of damage, in connection to DSM activities. The best defence against environmental damage is preparation. Therefore, the preliminary preparation for DSM missions in the form of plans of work, should receive the predominant focus for determining thresholds for the duration of the mission.

The Environmental Impact Assessment (EIA) process within the plan of work functions as the preliminary preparation for the DSM activities and they provide the opportunity to find the risks and provide solutions to mitigate potential damage.³¹⁸ Mitigation may entail adjusting the planned mining procedures and placing sufficient monitoring over the activities. Plans of work are intended to demonstrate to the ISA that the proposed mining activities comply with the UNCLOS and related instruments, including the rules, regulations, and procedures adopted by

³¹⁴ Hitchin et al. 2023, p. 2.

³¹⁵ ISBA/27/C/4, table 1, p. 16.

³¹⁶ Hitchin et al. 2023, p. 1–2.

³¹⁷ Ibid.

³¹⁸ Durden et al. 2018, p. 194.

the ISA, as well as national laws, and the mining contract.³¹⁹ It is required that before the work is initiated, research must be conducted regarding the conditions of the proposed mining area, to establish baseline data. After this, potential risks of negative environmental effects or damage, need to be determined.³²⁰

For the approval of plan of work for exploitation, the contractor must organize a specific set of documents, which the ISA then uses to determine the feasibility of said plan of work. The contractor delivers the certificate of sponsorship³²¹; written undertakings by the contractor to act in good faith, in accordance with the rules and regulations, and the mining contract, and to recognize the enforceability of all the rules and regulations; the mining workplan, which must contain details regarding the mineral resource type and its amount, the proposed mining area, programme of mining operations including timeframes and schedules, equipment, techniques and methods, a production plan including financial evaluation, et cetera, in accordance with DER, annex III; the financing plan; the environmental impact statement (EIS); the emergency response and contingency plan; the health and safety plan and the maritime security plan; the training plan; the environmental management and monitoring plan (EMMP); and the closure plan³²². The purpose of this extensive and mandatory preparation is for the ISA to ensure that the contractor has sufficient knowledge and understanding of possible consequences of the mining actions, and that the contractor is prepared to respond to these consequences, mitigating the harmful effects.³²³

The most important set of information is contained in the EIS. Its sole purpose is to document the results of the EIA, which, among many functions: identifies, predicts, evaluates and mitigates biophysical, social and other relevant effects of DSM; produces the environmental risk assessment and impact analysis about the potential environmental effects; and considers the mitigation measures to prepare the environmental management and monitoring plan (EMMP).³²⁴ The EIS is supposed to describe “the predicted effects of the project on the environment (and their significance), the measures that the applicant is committed to taking in order to avoid, minimize and reduce them where possible, and the residual (remaining) effects that cannot be avoided.”³²⁵

³¹⁹ ISBA/27/C/3, paragraph 2.

³²⁰ DER, regulation 47.

³²¹ DER, regulation 6.

³²² DER, regulation 7, paragraph 3.

³²³ Durden et al. 2018, p. 194.

³²⁴ DER, regulation 47, paragraphs 1 & 2.

³²⁵ ISBA/27/C/4, paragraph 6(c).

To research the existing environmental conditions of the mining area, the contractor conducts research on the physicochemical environmental conditions of the proposed mining area, which considers available previous research and on-site studies. This information provides the baseline data, which down the line is used as the comparison to understand the environmental effects through the comparable changes of the environmental elements.³²⁶ Baseline data is pivotal, as it provides information on original conditions that should be preserved at the first instance and restored in the second.³²⁷ The EIA procedure identifies the baselines and predicts the expected environmental effects of DSM. Once the EIS is submitted, it's always up to the contractor to ensure that the baselines are preserved as much as possible, without surpassing the relevant thresholds intended by the mining contract.³²⁸

Through the baseline research in the EIA process, the predetermined thresholds, or the methods to determine whether damage has occurred, should be elaborated in the EIS. That information should be implemented into the plan of work, which later become clauses of the mining contract.³²⁹ Essentially, the mining contract should indicate preliminarily to the contractor, which types of environmental effects could be considered to cross the thresholds, requiring, and assisting the contractor to undertake mitigating measures. While ecological thresholds would be in place through the available legal rules, action thresholds would need to be established for the purposes of pre-emptive mitigation of damage.

However, despite the gathered preliminary information, it has been predicted that negative environmental effects from DSM will be difficult to notice and document. The triggering mechanisms or the cause of damage may be unclear and may have gone unnoticed during the preliminary stage. Damage may accumulate and become noticed at a later stage or gradually, or the cause of damage is far away.³³⁰ There is also the element of cumulative impacts from different sources, that may contribute to the damage or accelerate the severity of damage of DSM. These other sources of damage may be other marine activities or natural environmental changes that complicates the finding of the initial cause.³³¹ A good example is the wandering

³²⁶ DER, annex IV, paragraph 4.

³²⁷ Kindji & Faure 2019, p 14.

³²⁸ ISBA/27/C/11, paragraph 7.

³²⁹ See ISBA/27/C/4, appendix (Information available from selected peer industries relevant to environmental impact assessments for deep-sea mining). The appendix holds a matrix of consideration for the existence of thresholds or methods to recognize impacts in connection to specific activities of DSM.

³³⁰ Howard et al. 2020, p. 14.

³³¹ Wasburn 2019, p. 36.

of sediment plumes which has already undergone thorough cycles of research by different organizations.³³² To mitigate and prevent damage from occurring during the exploitation phase, the contractor must, with its best efforts, implement and follow the environmental management and monitoring plan (EMMP).³³³

The EMMP contains the commitments and procedures for implementation of mitigation measures of environmental damage, as well as the terms in accordance with which the effectiveness of the measures are monitored and how reporting will be conducted for the ISA. Results of the monitoring should also determine the management responses to certain noticed effects.³³⁴ The monitoring procedures have been tested and the current technologies popularly employ vision-based underwater target detection, using developed computer vision and underwater robots.³³⁵ The EMMP is a continuous commitment, as the fulfilment of the objectives and the initial plan itself should be updated through monitoring results.³³⁶ The procedure helps produce continuous information about the conditions of the environment, through its instructional nature. The baseline data on the environmental conditions and the continuous monitoring should assist implementation of action thresholds, to ensure that certain measures are undertaken, when potential risks of environmental damage is sensed.

While some responsibility for continuous prevention of damage has been placed on contractors, some requirements for measures exceed the abilities of the individual contractors, even the substantial ones. The more extensive measures require the coordination of the ISA and its Members, for which Regional Environmental Management Plans (REMPs) are envisaged. REMPs are envisaged to function on a regional scale. In literature, it has been recognized that there are challenges regarding the implementation of REMPs. These include the need for a systemic approach for environmental regulation and management, such as understanding of cumulative impacts from different mining sites, as well as considering the effects of climate change on the contract area, during the contract term. These challenges include the establishment of thresholds, to understand the extent of damage, but the challenges also concern the recognition of potential liability.³³⁷

³³² F.eg. see Haalboom et al. 2023 or Spearman et al. 2020, for research of sediment plumes and their effects.

³³³ Durden et al. 2017, p. 199.

³³⁴ DER, regulation 48, paragraph 1.

³³⁵ Ma et al. 2021, p. 4.

³³⁶ Durden et al. 2017, p. 199.

³³⁷ Jaeckel 2020 (Strategic environmental planning for deep seabed mining in the area), p. 2-3.

As the exploitation activities finish, the environmental conditions should be measured and compared with the pre-mining baseline data. This will determine the extend needed to rehabilitate and compensation of damage may become relevant at this point.³³⁸ It's possible to assume that courts or tribunals will experience difficulties to determine the extent of damage without properly established thresholds and methods for identification of thresholds, despite the available assistance from competent experts and specialists. In fact, it would require a creative court to establish a system to determine damage and calculate their extent, to produce a compensation. An interesting example of such creativity can be found from the ICJ 2018 Costa Rica v. Nicaragua case, which is discussed in chapter 4.6.

5.3. Possible thresholds in the legal framework

This chapter focuses on the contents of international law as well as customary international law, considering the legal framework that is based on UNCLOS and other relevant international legal sources as sources for evaluation and determination of thresholds, that are currently applicable to damage that occurs in the context of DSM. Legal sources are probed for their linguistic formats and their practical intentions to synthesize a compilation of accessible thresholds. This chapter takes note of any recognized ecological thresholds and attempts to identify action thresholds. Furthermore, as it will become evident to the reader, the system of thresholds is not clear, and mechanisms for the determination of thresholds in practical applications need to be determined as well.

5.3.1. Functionality of causal factors as thresholds

It could be argued, that UNCLOS legal regime didn't exactly intend to predispose certain causes as thresholds, but this may have happened in practice. In principle, it will become evident from the following deliberation, that certain causes, established in the legal text, may automatically be considered as damaging, due to their effects on the surrounding ecosystems. Causes are essentially actions, events, or changes, that are potentially damaging. The question will be, can the following causes be applied as thresholds for plans of work, prevention of damage or identification of compensable damage during judicial proceedings. Borrowing from the

³³⁸ Durden et al. 2018, p. 199.

Casualty Investigation Code, causes will be referred to as “Causal Factors”. The provision prescribes an excellent definition for causal factors, as those actions, omissions, events or conditions, without which something would not have occurred.³³⁹

Considering the amount of attention to pollution within UNCLOS text, it could be argued that the instrument implies pollution being the most common causal factor of negative environmental effects to the marine environment. In simple terms, pollution is described as the introduction of harmful materials, pollutants, into the environment.³⁴⁰ UNCLOS defines pollution of the marine environment as “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”.³⁴¹

UNCLOS prescribes that States have an obligation to ensure that activities under their jurisdiction or control don’t cause damage by pollution to other States and their environment, and if pollution occurs, that it doesn’t spread beyond the areas where they practice their sovereign rights.³⁴² The State must also notify other States of any imminent danger of damage to the marine environment or if damage already has happened by pollution, if these other States may potentially be affected. Competent international organizations with response capabilities also need to be notified.³⁴³ Notified parties must then cooperate to eliminate the effects of pollution and preventing or minimizing the damage. Such cooperation efforts should eventually lead to joint development and promotion of contingency plans against pollution incidents in the marine environment.³⁴⁴

UNCLOS also requires the ISA to “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, 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

³³⁹ Casualty Investigation Code, Chapter 2, Paragraph 2.2.

³⁴⁰ National Geographic, website for education. Definition of Pollution.

³⁴¹ UNCLOS, article 1, paragraph 1(4).

³⁴² UNCLOS, article 194, paragraph 2 (Measures to prevent, reduce and control pollution of the marine environment).

³⁴³ UNCLOS, article 198 (Notification of imminent or actual damage).

³⁴⁴ UNCLOS, article 199 (Contingency plans against pollution).

or maintenance of installations, pipelines and other devices related to such activities.³⁴⁵ There's an indication for connection between mining activities and pollution as an ordinary occurrence during DSM missions.

This is just the small part of provisions, but it creates a question, whether UNCLOS intends to categorize pollution as damage constituting liability and rendering it as a threshold. Furthermore, is there an intention to establish compensation for pollution. It's possible to argue that there's an implication in UNCLOS that "pollution and other hazards", as well as "interference with the ecological balance" are the main causes of damage to the marine environment and could perhaps be regarded as thresholds for determination of damage. However, pollution in all its forms cannot be included in its entirety as a threshold of environmental damage. The consequences of pollution above certain thresholds, having adverse effects, may be considered as environmental damage and wrongful pollution as such. But it would be problematic to consider the expected or acceptable extent of pollution, resulting from standard operations, as damage.

Therefore, pollution itself cannot be used as a threshold for evaluation of whether damage has occurred or not, but rather requires threshold within its own definition to establish the difference between expected outcomes and damage (or wrongful pollution).³⁴⁶ Pollution should be therefore treated more as a causal factor, rather than as a threshold itself. However, it should be noted that certain action thresholds are in place, as is noticeable from UNCLOS article 198. The provision urges parties to notify other States of any imminent danger of pollution. While pollution itself is not a threshold, it seems that the provision urges action at a certain point. The unanswered question remains and needs clarification, if some level of pollution is acceptable, how severe is the envisaged form or effect of pollution, that it would require the notification of other States?

"Other hazards" are also not particularly well defined in UNCLOS, but perhaps the intention was maintaining the potential list of causal factors undetermined, as damage to the marine environment may manifest themselves in other unexpected forms.³⁴⁷ To imagine some of these instances, such damage could occur through a destruction of specific marine habitats through a blunt force, if a mining harvester drives over a coral reef, or through the disturbance and/or

³⁴⁵ UNCLOS, article 145(a).

³⁴⁶ Voigt 2021, p 9.

³⁴⁷ UNCLOS, article 145(a).

release of sediment plumes, in connection to the processing of mineral resources. The intention must have been to ensure the establishment of different causes of damage more easily, rather than limiting the strict application of the rule. However, the concept of “other hazards” cannot function as a threshold for the evaluation of damage by itself, as it lacks specificity.

“Interference with ecological balance” also seems to present certain causal factors for damage but requires further specificity through the application external thresholds.³⁴⁸ DSM will inevitably impact different animal species over large territories and long timeframes, with various effects due to the complexity and seasonal variations of the ocean circulation. Together with other cumulative effects, such as climate change, DSM may reduce surface primary production and carbon export to the deep-sea.³⁴⁹ However, it is difficult to qualify mere “interference” with a balanced ecological process as damage that triggers the liability regime, with the risk of being considered overly stringent and aggressive. However, it can be argued, that “interference” could function as an action threshold. In that case, a certain level of interference could trigger the obligation for the contractor to adjust its mining procedures to prevent further escalation of damage or harm.

More indicators for damage can be noticed in the exploitation regulations. The DER contains the concept of “Incidents” which are defined as events, or sequence of events, of a marine incident or a marine casualty (as defined in Casualty Investigation Code); or serious harm to the marine environment or other interests (independent of intent), or situations where serious harm to marine environment is a reasonably foreseeable consequence; or damage to installations such as submarine cables or pipelines.³⁵⁰ The provision proposes a coherent synthesis of different types of damage, but requires further reading to elaborate on some parts. For example, the Casualty Investigation Code has an extensive definition of marine casualties. It considers that events that occur directly in connection with the operations of a ship. These events include death, sinking or damaged ships, damage to the environment, etc.³⁵¹ Meanwhile, marine incidents are events that may endanger the ship, the occupants, other persons, or environment.³⁵²

³⁴⁸ UNCLOS, article 145(a).

³⁴⁹ Tilot et al. 2021, p. 4.

³⁵⁰ DER, schedule (Use of Terms and Scope), “Incident”.

³⁵¹ Casualty Investigation Code, chapter 2, paragraph 2.9 (Marine Casualty).

³⁵² Casualty Investigation Code, chapter 2, paragraph 2.10 (Marine Incident).

It should be noted that the provisions concern shipping operations, that are outside the scope of this paper. However, some notes can be made. The provisions in the Code include death and sinking, which are undeniably direct examples of damage. However, the provisions fail to provide thresholds to understand damage to the environment. Similarly, DER schedule delivers damage to underwater installations as clear indications of that. But *serious harm* to marine environment is not properly defined. See the following chapter for the deliberation for *serious harm*. It seems that there is a difficulty to establish a threshold for damage to the marine environment, as evidenced in previous chapters.

The DER also considers “Notifiable events”, that require the contractor, among other further requirements, to notify the sponsoring State(s) and the Secretary-General of the ISA of the events that are listed in appendix I of DER.³⁵³ Appendix I lists the notifiable events: fatality of a person; missing person; occupational lost time illness; occupational lost time injury; medical evacuation; fire/explosion resulting in an injury or major damage or impairment; collision resulting in an injury or major damage or impairment; significant leak of hazardous substance, unauthorized mining discharge; adverse environmental conditions with likely significant safety and/or environmental consequences; significant threat or breach of security; implementation of emergency response and contingency plan; major impairment/damage compromising the ongoing integrity or emergency preparedness of an Installation or vessel; impairment/damage to safety or environmentally critical equipment; significant contact with fishing gear; and contact with submarine pipelines or cables.³⁵⁴

“Notifiable events” in their general sense provide a fairly coherent list of potential incidents that may occur in connection to the DSM. Certain forms of damage are obviously clearly calculable for their direct and indirect damaging effects and resulting costs for the subjective interests. But the list also contains two potential and interesting thresholds for environmental damage, to be considered: *significant* leaks of hazardous substances and *unauthorized* mining discharges.³⁵⁵ Here significance could be evaluated based on the same standards as discussed in connection to 2006 ILC Draft principles on the Allocation of Loss in the Case of Transboundary Harm Arising out of Hazardous Activities. Meanwhile, ‘unauthorized’ simply reflects the wrongful nature of the mining discharge. Unfortunately, the intention of these applications will be left unanswered until new commentary on the DER is available.

³⁵³ DER, regulation 34 (Notifiable events).

³⁵⁴ DER, appendix I, “Notifiable events”.

³⁵⁵ DER, appendix I, “Notifiable events”.

Furthermore, the notification requirement itself may give rise to consider the notifiable elements simply as action thresholds, that do not provide an exact threshold to utilize as determinant of damage. However, as an intermediate conclusion, the aforementioned causal factors can be understood as thresholds in those clear cases of damage, as both the cause and the private interest are easily determined. However, causes such as pollution, mining discharges, leaks, et cetera, require the application of thresholds within themselves. For example, if a mining discharge is authorized, but causes damage as such, then liability would be difficult to attach in accordance with the definition of notifiable events. In that case, another form of threshold would have to be considered to establish damage and assign liability.

5.3.2. Recurring phrases: Harmful Effects, Serious Harm, and Significant Adverse Change

UNCLOS contains several descriptive phrases or concepts to measure negative environmental effect, which have also translated to the other instruments under the legal framework. These phrases or concepts are recurring, but there are not definitions for them. Therefore, this part intends to investigate the intention behind these phrases and their compatibility for use as thresholds.

One of these is the concept of *harmful effects*. UNCLOS considers that activities that risk causing *harmful effects*, include drilling, dredging, excavation, disposal of waste, construction and operation or maintenance of installations, pipelines and other devices related to the activities.³⁵⁶ It's not explicit whether UNCLOS intends the use of *harmful effects* as a threshold to indicate damage. Another phrase is *serious harm*. For example, as the executive organ of the ISA which, among other duties, makes decisions regarding the plans of work, the Council may issue emergency orders to adjust or suspend operations to prevent *serious harm* from occurring, or disapprove exploitation in areas where substantial evidence indicates the risk of *serious harm* to the marine environment.³⁵⁷ *Serious harm* is not substantially defined further and it's also not explicitly provided either whether this concept should function as a threshold.

The Mining Code recognizes both concepts as well. For example, the *harmful effects* is utilized in exploration regulations as a standard for the ISA to follow when establishing and maintaining

³⁵⁶ UNCLOS, article 145(a)

³⁵⁷ UNCLOS, article 162, paragraph 2(w & x) (Powers and functions).

a periodic review of the environmental rules, regulations, and procedures to ensure effective protection for the marine environment from *harmful effects* of mining. The same objective intentions should be followed by the sponsoring States and the ISA when practicing the precautionary approach.³⁵⁸ Furthermore, the LTC must develop and implement procedures to determine whether exploration activities could cause *harmful effects*, and with that outcome, ensure the sufficient management to prevent such effects or that exploration would not proceed.³⁵⁹ Meanwhile the DER sets a general requirement to “[p]rovide, pursuant to article 145 of UNCLOS, for the effective protection of the Marine Environment from the *harmful effects* which may arise from Exploitation...”³⁶⁰ These provisions can be seen as manifestations of action thresholds, as they focus on establishing a pre-emptive response to potential risk of *harmful effects*.

Exploration regulations has a slightly better coverage for *serious harm*. *Serious harm* to the marine environment is considered as “any effect from activities in the Area on the marine environment which represents a significant adverse change in the marine environment determined according to the rules, regulations and procedures adopted by the Authority on the basis of internationally recognized standards and practices”.³⁶¹ The provision seems to require additional deliberation to determine the application of the concept, because it delegates the determination to the ISA.

Similarly, the DER is nearly verbatim to the previously referenced provision. However, it adds that determination should be based on internationally recognized standards and practices AND be informed by Best Available Scientific Evidence (BASE).³⁶² The concept of *serious harm* requires a deeper deliberation, because the concept is further complicated by adding the concept of *significant adverse change* as the threshold for even considering an effect as *serious harm*. ISA is responsible of the methods and thresholds of determining such *significant adverse change*.³⁶³ It’s important to note that the concept of *serious harm* is also placed under the umbrella of “Incidents”.³⁶⁴

³⁵⁸ PMN Regulations, regulation 31, paragraphs 1 & 2; PMS Regulations, regulation 33, paragraphs 1 & 2; and CFC Regulations, regulation 33, paragraphs 1 & 2.

³⁵⁹ PMN Regulations, regulation 31, paragraph 4; PMS Regulations, regulation 33, paragraph 4; and CFC Regulations, regulation 33, paragraph 4.

³⁶⁰ DER Regulation 2(e). (Fundamental policies and principles). Referring to UNCLOS Article 145 which prescribes a general obligation to States Parties to protect and preserve the marine environment.

³⁶¹ PMN Regulations, regulation 1, paragraph 3(f); PMS Regulations, regulation 1, paragraph 3(f); and CFC Regulations, regulation 1, paragraph 3(f).

³⁶² DER, schedule (Use of Terms and Scope), “Serious harm”.

³⁶³ Mackenzie 2019, p. 15-16.

³⁶⁴ DER, schedule (Use of Terms and Scope), “Incident” (b)

To gather some further understanding into the elements of applying *significant adverse changes*, it has been proposed to draw inspiration from the 2009 International FAO Guidelines adopted in the context of deep-sea bottom fishing on the high seas. The guidelines utilize the phrasing *significant adverse impacts*, from which it's possible to draw a comparison.³⁶⁵ The guidelines are intended to assist the implementation of 2006 UNGA Resolution, which requires states and regional fisheries management organizations to “assess, on the basis of the best available scientific information, whether individual bottom fishing activities would have *significant adverse impacts* on vulnerable marine ecosystems and to ensure that, if it is assessed that these activities would have *significant adverse impacts*, they are managed to prevent such impacts, or not authorized to proceed”.³⁶⁶ The provision already includes action thresholds by providing procedural options, if *significant adverse impacts* are identified.

The guidelines recognize that *significant adverse impacts* compromise ecosystem structure or function in a manner that: “(i) impairs the ability of affected populations to replace themselves; (ii) degrades the long-term natural productivity of habitats; or (iii) causes, on more than a temporary basis, significant loss of species richness, habitat or community types. Impacts should be evaluated individually, in combination and cumulatively.”³⁶⁷ Furthermore, it is stated that during the determination of the scale and significance of the adverse impact, factors such as the intensity or severity of the impact, the size of the impact relative to the availability of the affected habitat type, the sensitivity/vulnerability of the ecosystem to the impact, and the ability of an ecosystem to recover from the impact, and the speed of such recovery, should all be considered.³⁶⁸ The guidelines are quite clear regarding the application of the concept, and similar provision in the Mining Code would greatly improve the deliberation of damage in connection to DSM activities. Notably, the guidelines establish the mechanism to determine appropriate thresholds of damage.

In fact, similar provision has been produced by ISA. The Draft standard and guidelines for the environmental impact assessment process (ISBA/27/C/4) envisage that significance of impacts or changes to the environment should be assessed already during the initial EIA process, as a

³⁶⁵ Levin et al. 2016, p. 248.

³⁶⁶ A/RES/61/105, paragraph 83(a).

³⁶⁷ FAO guidelines 2009, paragraph 17.

³⁶⁸ FAO guidelines 2009, paragraph 18.

part of the process towards the review of the plan of work and its contents.³⁶⁹ For example, the EIA considers: the extent of the change from baseline condition and its impact relative to habitats disturbed; the duration of the impact as well as its reversibility; costs and feasibility of mitigation; the importance or value of biodiversity, human resource use, or ecosystem service use; et cetera.³⁷⁰ Furthermore, the overall significance of the damage should be determined by comparing the magnitude of the environmental effect with the sensitivity of the receiving environmental element. There are several levels to evaluate the level of significance, but the final judgement of the most likely level of significance should be based on an expert's professional judgement. The levels of significance are listed as: not significant, minor, moderate, major, or substantial.³⁷¹ However, it is stated that each predicted crossing of thresholds should be met with mitigation plans to reduce the magnitude of the impact and the significance of its effect.³⁷²

It could be argued, that since the mining contract may already indicate the appropriate thresholds for the duration of the DSM mission, this could be the regulatory solution for the current vacuum of deliberation. After all, contractors are required to follow the clauses of their mining contract, that is based completely on the initial plan of work. Breach of such clauses could be reviewed by the court or a tribunal as a basis for establishing liability for the contractor, and potentially, for the sponsoring State as well.

ISA has not implemented rules regarding the evaluation of *serious harm* through the prism of *significant adverse changes, per se*, but it can be presumed that similar form of analysis will be conducted in connection to the initial event of dispute resolution regarding damage. *Serious harm* is argued to set an unreasonably high threshold before liability of harm is triggered.³⁷³ The 2006 ILC Draft principles on the Allocation of Loss in the Case of Transboundary Harm Arising out of Hazardous Activities considers that significant damage as something more severe than merely “detectable”, but below the level of “serious” or “substantial”.³⁷⁴ In this regard, the liability for harm is triggered for damage that is substantial but extends to the level below

³⁶⁹ ISBA/27/C/4 Draft standard and guidelines for the environmental impact assessment process, paragraph 65 (Impact significance).

³⁷⁰ ISBA/27/C/4, paragraph 65, table 3.

³⁷¹ ISBA/27/C/4, paragraph 74.

³⁷² ISBA/27/C/4, paragraph 69.

³⁷³ Mackenzie 2019, p. 15.

³⁷⁴ The commentary on principle 2 of 2006 ILC Draft principles on the Allocation of Loss in the Case of Transboundary Harm Arising out of Hazardous Activities, paragraph 2-3, p. 65.

serious. This solution would counteract the argument of *serious harm* being an unreasonably high threshold for damage.

The seriousness or the significance of negative environmental effect is evaluated based on their causation of detriment, for example, to human health, industry, property, environment, or agriculture in other States. The environmental effect must also be susceptible to measurements by factual and objective standards. Thereby, the proper evaluation of the significance of harm may depend on the facts of the case and vary based on local and regional circumstances.³⁷⁵ Therefore, a combination of aspects may be evaluated interconnectedly. The European Union Environmental Liability Directive (ELD) considers multiple factors when determining the significance of damage that may cause adverse changes, such as the characteristics, amount and rarity, ability to regenerate, et cetera. In accordance, if the negative effects cause fluctuations that are within expected parameters for the affected species or habitat, or if there's a natural ability to recover within a short period of time without any additional help, such damage cannot be deemed as "significant".³⁷⁶ The question is in the ability of the environment to regenerate within a short period of time. The timeframe for natural recovery is evaluated on factors such as vulnerability of the natural resources and/or impaired services, the physical, biological, and chemical components of the environment impacted, or the resilience.³⁷⁷

Indicators that may be used to determine the potential significant adverse changes or impacts, could include, but not be limited to: extinction, significant decline in abundance, decline in foundation species, reduction below critical reproductive density, loss of source populations, loss of critical stepping-stone populations, alteration of key trophic linkages among species in a community, reduction in species diversity beyond natural levels of variability, regional declines in habitat heterogeneity, such as loss of entire habitats or community types, impairment of important ecosystem functions such as biomass production, nutrient recycling or carbon burial, which results in loss of carbon sequestration capacity, genetic resources, or fisheries production.³⁷⁸ It should be noted how each decision and determination of damage (*serious harm* or *harmful effects*) is required to be made based on scientific knowledge.

³⁷⁵ The commentary on principle 2 of 2006 ILC Draft principles on the Allocation of Loss in the Case of Transboundary Harm Arising out of Hazardous Activities, paragraph 2-3, p. 65.

³⁷⁶ European Union Environmental Liability Directive (ELD), annex I.

³⁷⁷ Kindji & Faure 2019, p. 13–15.

³⁷⁸ Levin et al. 2016, p 248.

As an example, *serious harm* is to be determined while being informed by Best Available Scientific Evidence (BASE).³⁷⁹ ISA, sponsoring States and contractors, in connection to their measures of ensuring effective protection for the Marine Environment from *harmful effects*, must integrate BASE in environmental decision-making. The decisions must include all risk assessments and management undertaken in connection with environmental assessments, and the management and response measures taken under or in accordance with Best Environmental Practices...”³⁸⁰ Therefore, the decisions upon the severity of certain negative environmental effect should be heavily based on the scientific understanding of that effect.

However, determination of thresholds and damage cannot be solely based on the scientific evaluation alone, as it would undermine the effective functioning of the liability regime. Evaluation of economic, humanitarian, and political factors needs to be considered. Environmental science can produce variable results, which does not provide guarantees on uniformity of judgements. The assessment of damage to the marine environment faces considerable challenges, due to the level of current scientific knowledge, the gaps in baseline data, and concerns about the potential for irreversible damage.³⁸¹ Assessment of changes in the deep-sea ecosystems resulting from mining activities is extremely difficult due to the remoteness of the Area and the expensive price-tag of the needed research into the Area.³⁸²

These realities consequently leave major gaps in the understanding of baselines such as ecosystem structure, function and tolerances, biogeography, habitat distribution patterns, population connectivity, et cetera. Most deep-sea species also remain unidentified. Without this information the consequences of mining activities are hard to measure.³⁸³ Meanwhile, the definitions made by the ISA in the DER intends to elaborate on the various complexities of the marine ecosystem, those complexities remain very difficult to assess in the context of valuation, compensation, restoration or restatement.³⁸⁴ That is the reality today and this is why the precautionary pause is considered so important; to give more time to research the effects of activities on the environment and the risks of potential damage. Therefore, the solution seems to be time, and having enough of it to establish a predetermined system of thresholds within the legal regime for DSM.

³⁷⁹ DER, schedule (Use of Terms and Scope), “Serious harm”.

³⁸⁰ DER, regulation 44 (c)

³⁸¹ Mackenzie 2019, p 14.

³⁸² Levin et al. 2016, p 248.

³⁸³ Ibid.

³⁸⁴ Mackenzie 2019, p. 14.

For all intents and purposes, the usage of both concepts of *harmful effects* and *serious harm* remain to be determined. As the DER is yet to be fully completed, there is hope that changes regarding the recognition and determination of damage through concrete thresholds will be adapted by ISA. However, both concepts, being readily available in the legal framework, have the most potential to function as effective thresholds for damage. Furthermore, the ISA will eventually undertake a review on the functionality of the rules and regulations, and based on that information, propose organs to take measures to improve the operation of the legal framework.³⁸⁵ As a proposal, ISA should utilize FAO guidelines 2009 as a model for implementation of the methodology to determine the extent of serious harm through the lense of significant adverse changes, in the Draft Exploitation Regulations. This approach would provide clear basis of thresholds as well as the methods to establish the extent of environmental damage. Clear thresholds would then lead to clear identification of damage, and a coherent determination compensation.

³⁸⁵ UNCLOS, article 154 (Periodic review).

6. Conclusion

From apocalyptic scenarios to realistic depictions of environmental responses to activities in the Area, damage to the environment seems to be the most contemplated matter in the deep seabed mining zeitgeist. Like any modern industry, especially with examples from terrestrial mining, seabed mining is expected to cause damage to the marine environment and potentially to private and public interests of the humankind and individuals. Liability for damage has been discussed extensively, as developing States intend to participate in the mining activities during the exploitation phase but fear the potential repercussions from accidental negligence. It has indeed been prognosed that costs to repair damage in the marine environment will exceed the potential profits tenfold. Then why has the development of the legal framework been stagnant to produce definitive rules to determine compensation for damage?

This research paper has embarked on a short journey to find the answer to the question:

How is compensable damage determined under the legal framework of deep seabed mining in areas beyond national jurisdiction?

To approach this research question, in chapter 2 the paper began by introducing key concepts, the administrative and political environment around activities in the Area, and the legal framework connected to deep seabed mining. The intention of this extensive chapter was simply to introduce the reader to the topic, that seems to be novel even for seasoned legal professionals. It was important to delimit the legal boundaries and area of focus of the research. The legal framework subchapter was also important, as it prepared the reader to consider the legal sources, that are relevant to deep seabed mining in areas beyond national jurisdiction.

The key ingredients were discussed in chapters 3, 4, and 5. As it was determined, the compensation regime is not a cohesively defined system within the international legal framework. In fact, it seems that deliberation for compensation measures have been left for the domestic legal systems of sponsoring States. However, deep seabed mining in the Area concerns the whole international community, rather than just the coastal States in the immediate vicinity of mining activities. Therefore, considering the international legal framework for the inevitable occurrence of damage and its compensability is relevant. To create a coherent overall picture on determination of compensable damage within the legal framework, three key ingredients needed to be considered. First, methods of attribution of liability were considered. Second,

different recognized subjects of damage were considered. Third, possible thresholds of damage within the legal framework were identified and researched for their potential.

Chapter 3 considered the liability regime for deep seabed mining. In general, the topic has received its fair share of attention by the international community. The chapter approached the issue by identifying the conditions for attribution of liability. In essence, the objective was to consider, how liability is attached to the state or private entity, when damage occurs. The key findings in the chapter were the close connection between pre-established responsibilities to fulfil certain obligations, and damage. The research found that liability for damage within the legal framework for deep seabed mining attributes liability only when there's a clear breach of an obligation. Meanwhile the liability regime doesn't recognize strict liability, therefore accidental causes of damage doesn't attach liability, as long as it has been sufficiently proven that due diligence and best possible efforts have been practiced to prevent or mitigate damage.

Chapter 4 considered the potential forms of damage by researching the potential subjects and corollary claimants for damage. The first part of the chapter considered the synthesised five-part list of the CIGI Legal Working Group, that was based on the definition of compensable damage from the 2011 Advisory Opinion, from the Seabed Disputes Chamber of ITLOS. This synthesized list considered the different forms of damage. The objective was to delve deeper into those categories and consider the potential claimants and the implications of certain forms of damage. Furthermore, the legal background for the claims were considered as well. However, the more research-oriented intention of this consideration was the differentiation of damage into different categories. It was found that due to the geophysical characteristics of the marine environment, the environmentally damaging effects can cause direct and indirect damage to other interests as well. Secondly, the research differentiated material and immaterial damage. While material damage is easily quantified, immaterial damage is slightly more complicated to propose. It was considered that value could be given to moral values, but essentially the research boiled down to the more important find.

The investigation reached a differentiation between damage to private or public interests, and damage as pure environmental loss. The former concept considers damage in their traditional sense to consist of compensation for financial losses, breach of moral values, pain or suffering, or other objectively measurable subjective interests. The latter concept considers the inherent value of the environment, that cannot necessarily be measured by any available method of calculation. Certainly, environmental damage may be compensated as the losses of the parties

that have attempted to mitigate, prevent, or repair damage, or losses through other corollary effects, such as loss of livelihoods or ecosystem services. However, it was considered that certain economic value could be given to the environment, despite its repair costs exceeding the estimated profits of any mining contractor. What can be concluded from this, is that the Area is the Common Heritage of Mankind and, therefore, the compensation for damage would be owed to the humankind as a whole. Meanwhile, the International Seabed Authority acts on behalf of the humankind and as its representative. The compensation would then be made available to the compensation fund, of which the establishment has been urged by many interested parties.

A call for action was made for the determine the appropriate amount of compensation. It was stated that while the potential amount of liability is stated as “actual amount of damage”, certain mechanism to calculate this “actual amount” needs to be created within the international legal framework to ensure uniform application of compensation rules. This mechanism must be reasonably justifiable and by all ISA members through a public voting procedure. Furthermore, it should consist of saving clauses or other forms of limitations, to consider the realistic potential for reimbursement. The intention should not be complete economic annihilation of the contractor or the sponsoring State, but to fulfil the objective of repairing or restoring the damaged resource or environmental element.

Finally, chapter 5 researched the third ingredient - thresholds for damage. The research of the chapter identified the possible thresholds of damage within the legal framework and speculated on their potential to function as indicators for the occurrence of damage. The initial idea behind the research was the lack of sufficient scientific knowledge of damage at the seabed, and the difficulty to recognize or notice damage below the sea surface, especially in the deep sea. This idea led to the question, whether the international legal framework has been implemented with the recognition and determination of damage through thresholds. The chapter functioned as the investigative outreach to identify different forms of thresholds and considered their applicability to the identification of damage. It was identified that thresholds are elemental for three situations in the context of protection of the environment: the planning of mining activities (plans of work), the implementation of prevention and mitigation measures during mining activities` (EMMPs and REMPs), and the determination of damage once they have occurred. Each of these situations were presented and explained in short.

The chapter was then separated into two distinct parts, focusing on the contents of the legal framework and into available references to certain phrases and concepts, which could potentially be used as thresholds in damage evaluation. The two parts were: causal factors and recurring phrases. The former part identified certain causal factors, primarily within UNCLOS and the Mining Code. Causal factors were defined as effects that could cause damage, as the legal framework focused some provision on the prevention or mitigation of these effects. However, the legal framework didn't seem to consider liability or compensation regime for their occurrence. One good example in the legal text is pollution. As the legal framework intends to minimize and prevent pollution, many provisions were written with that focus in mind. However, it was found that causal factors may not function as thresholds, since legal text remains vague about their characteristics and methods for their measurements.

The second part of chapter 5 considered recurring phrases, namely: Harmful Effects, Serious Harm, and Significant Adverse Change. These three phrases were connected to each other and seemed to be repeated recurrently in UNCLOS and related instruments when describing damaging effects. The chapter considered the meaning of these phrases and potential methods to calculate the intended extent of damage behind them. These phrases showed the most potential to function as thresholds. The key finding was a particular connection between Serious Harm and Significant Adverse Change. According to the legal text, serious harm to the marine environment was measured by its ability to create a significant adverse change in the marine environment. This phrase was then considered through the language of similar language in other legal sources, that defined the methods to calculate the significance and adversity of the change.

One particularly detail legal source was the 2009 International Guidelines for the Management of Deep-sea Fisheries in the High Seas (FAO guidelines 2009). These guidelines have the methods to determine significant adverse impacts, from which it's possible to draw a comparison to significant adverse changes. Naturally, it was found that scientific data was at the forefront of those methods. For example, the methods contemplated the ability of the damaged elements to regenerate without additional external assistance, as well as the rate of said regeneration. The extent of damage is also considered.

In essence, the calculation methods are fairly clear. The call for action is for the International Seabed Authority to determine the applicability of these thresholds further. However, *serious harm* seems to pose as the optimal choice to be considered as a threshold. It was proposed that the Authority should utilize the FAO guidelines 2009 as a model for implementation of the

methodology to determine the extent of serious harm through the lense of significant adverse changes and implement this model into the Draft Exploitation Regulations. It was argued that this approach would provide a clear basis of thresholds as well as the methods to establish the extent of environmental damage. Clear thresholds would then lead to clear establishment of damage in the international context, and a coherent determination of compensation for interested parties.

Finally, it is time to reiterate the point of the research concerning compensable damage in the international context. As stated in the beginning of this conclusion, compensable damage is not clearly defined in the international legal regime for deep seabed mining. It appears that these determinations are to be made by the sponsoring States, that monitor the mining activities of their sponsored contractors. However, this task will logically be unapproachable by most states due to many constraints. Furthermore, the different legal systems would establish compensation for damage that would not function in a uniform manner. Difference in stringency of legal systems may lead to a State of Convenience (Flag of Convenience for ships) situation, where contractors would choose a sponsoring State with less stringent legal systems. Despite the equal treatment for both developed and developing States, this problem has not been eradicated. As a suggested topic for future research could be the topic relating to methods of calculation of compensable damage in a dispute settlement context, such as an international court or tribunal.