SECURING THE SEABED: AUSTRALIA'S STRATEGIC CHOICES IN DEEP-SEA MINING

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EXECUTIVE SUMMARY

Deep-sea mining is accelerating from speculative ambition to strategic reality, carrying profound implications for Australia's security, economy, and influence in the Pacific. With an estimated 8 to 20 trillion USD in critical minerals underpinning global decarbonisation, competition for the seabed is intensifying while legal uncertainty, environmental risk, and foreign-state ambitions threaten to reshape maritime power balances. For a nation whose prosperity relies on secure sea lanes and a stable rules-based order, these emerging pressures cannot be ignored. This report assesses how developments in deep-sea mining intersect with Australia's defence interests across environmental, legal, and geostrategic dimensions. It contends that Australia must reinforce international law, monitor Pacific Island states' interest in deep-sea mining, and be ready to respond if maritime international law norms are destabilized. Australia has an opportunity to be a regional leader in sustainable and legally compliant deep-sea mining, but it must first understand the dynamics and complex issues playing out in the Indo-Pacific and beyond.

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This work reflects my own views and does not necessarily reflect the official policy or position of the Australian Government, the Department of Defence and the Royal Australian Navy.

1. INTRODUCTION

Beneath the ocean's surface lies an extraction-industry revolution waiting to begin. Polymetallic nodules the size of potatoes lying loose on the seabed floor can power electric vehicles or be used to build satellites and submarines. Deep-sea mining (DSM), worth an estimated eight to 20 trillion USD, is the next resource race.[1] It is also a tangle of environmental uncertainty, legal fragility, and great-power rivalry. For Australia, the importance of the ocean cannot be understated. Australia is a maritime nation, dependent on open and secure sea lines of communication and trade. DSM promises economic and strategic gains but poses unresolved ecological risks, with limited scientific understanding of how extraction will affect fragile benthic ecosystems and broader ocean health.

Why Australia must understand the environmental uncertainties is discussed first because they directly shape the legal frameworks governing DSM and the geostrategic tensions emerging in the Pacific.

The legal framework governing deep-sea mining – anchored in the United Nations Convention on the Law of the Sea (UNCLOS)[2] and administered by the

[1] Ilya Epikhin et al., "Seabed Mining: A $20 Trillion Opportunity," *Seabed Mining: A $20 Trillion Opportunity - The Future of Resource Extraction?*, August 2024, https://www.adlittle.com/en/insights/viewpoints/seabed-mining-20-trillion-opportunity#:~:text=Seabed%20mining%20offers%20a%20unique,)%2C%20and%20other%20green%20technologies.

[2] United Nations Convention on the Law of the Sea, opened for signature 10 December 1982, 1833 UNTS 397 (entered into force 16 November 1994) art 145.

International Seabed Authority (ISA) – remains fragmented, slow moving and is ill equipped to manage rapid technological and geopolitical change and environmental uncertainty. Understanding these legal ambiguities is essential. The erosion of clear maritime rules invites great-power competition into the Pacific and challenges Australia's commitment to the rules-based order. Section Two outlines the current state of the law governing DSM, highlights the legal gaps and ambiguities, and analyses how unilateralism by the United States threatens to destabilise the maritime rules-based order.

Section Three examines the broader geostrategic implications of DSM in the Indo-Pacific and analyses the impact on three key actors: China, America, and the Pacific. It explains how DSM is rapidly becoming a new front in great-power competition, with China expanding its influence through the ISA's framework and Pacific partnerships while the United States pursues a unilateral licencing scheme outside UNCLOS. For Australia, recognising these dynamics is time critical; shifts in regional alignments and seabed governance will determine Australia's ability to uphold maritime stability, protect its sea lines of communication, and lead a coherent regional response within the region.

2. CONTEXT AND BACKGROUND

More than 99 per cent of Australia's international trade by volume is carried by sea,[3] and 99 per cent of international communications are through seabed cables.[4] The ocean is not only a conduit for trade and communication but a vast repository of resources.[5] This resource abundance presents opportunities and risks for Australia. As Hedley Bull noted, the 'scramble' at sea is as much about defending rights as it is seizing unclaimed resources.[6]

[3] "Operating Environment – Snapshot | Australian Maritime Safety Authority," accessed August 26, 2025, https://www.amsa.gov.au/operating-environment-snapshot.
[4] Samuel Bashfield and Anthony Bergin, "Options for Safeguarding Undersea Critical Infrastructure: Australia and Indo-Pacific Submarine Cables," National Security College, June 14, 2022, https://nsc.anu.edu.au/content-centre/research/options-safeguarding-undersea-critical-infrastructure-australia-and-indo.
[5] Sea Power Centre Australia, *Why Australia Has a Navy*.
[6] Hedley Bull, "Sea Power and Political Influence," *The Adelphi Papers* 16, no. 122 (1976): 1–9, https://doi.org/10.1080/05679327608457271.

Australia's strategic posture, as defined in the 2023 Defence Strategic Review, situates the "Defence of Australia" at the intersection of protecting national economic interests and upholding the rules-based international order.[7] The Review identifies coercion within Australia's Exclusive Economic Zone (EEZ) and disruptions to sea lines of communication in the Indo-Pacific as major national security risks. The 2024 National Defence Strategy reinforces this by framing both the United States and Pacific Island partners as critical to Australia's security architecture.[8]

DSM exposes how unilateral American licencing of DCM threatens the maritime rules-based order Australia depends on, and that Pacific regionalism is fragmenting over DSM-related tensions. Managing DSM will therefore test Australia's ability to balance alliance loyalty, regional leadership, and its long-standing advocacy for international maritime law. This report aims to inform Australia of the strategic opportunities and challenges DSM poses, and how it may redefine Australia's place in the Indo-Pacific. It is also designed to stimulate further interest and research within Australia.

Section One: Environmental and Economic Opportunities and Challenges

The deep ocean is emerging as both a critical resource frontier and a potential fault line in environmental and strategic terms. This section examines the environmental and economic foundations of DSM, identifying what is known, what remains uncertain, and how these knowledge gaps are affecting international scientific scholarship. This section frames the underlying tensions; the rifts that resulted in the legal and geostrategic domains are examined in sections two and three.

What is seabed mining?

[7] Department of Defence, "National Defence: Defence Strategic Review 2023," Website, Defence, April 24, 2023, https://www.defence.gov.au/about/reviews-inquiries/defence-strategic-review. pp 6-7.
[8] Department of Defence, "2024 National Defence Strategy and 2024 Integrated Investment Program," Website, Defence, October 2024, https://www.defence.gov.au/about/strategic-planning/2024-national-defence-strategy-2024-integrated-investment-program. Note sections 7.8 and 7.13 specifically.

DSM may be a foreign concept to many, as the industry is nascent and littered with unknowns. DSM targets three main categories of seabed resources, illustrated in Figure One. Firstly, polymetallic manganese nodules, which are potato-sized rocks lying loose on the sea floor in abyssal plains approximately 4-6 kilometres below sea level.[9] They are most abundant in the Clarion Clipperton Zone (CCZ), which lies predominantly in international waters in the eastern North Pacific Ocean.[10] These nodules contain copper, nickel, manganese ore, and cobalt.

The second type of resource is seafloor massive sulphides (SMS). SMS are located in hydrothermal vents along mid-ocean ridges between 1.5 – 3 kilometres below sea level.[11] There are an estimated 550 vent sites globally and are rich in copper, zinc, silver, and gold.[12] Finally, the third resource type is cobalt and manganese rich crusts. These typically form 800 metres to 2.4 kilometres below sea level.[13] Primarily located in the Prime Crust Zone in the Pacific Ocean, they contain copper and nickel, with trace amounts of rare-earth minerals.[14]

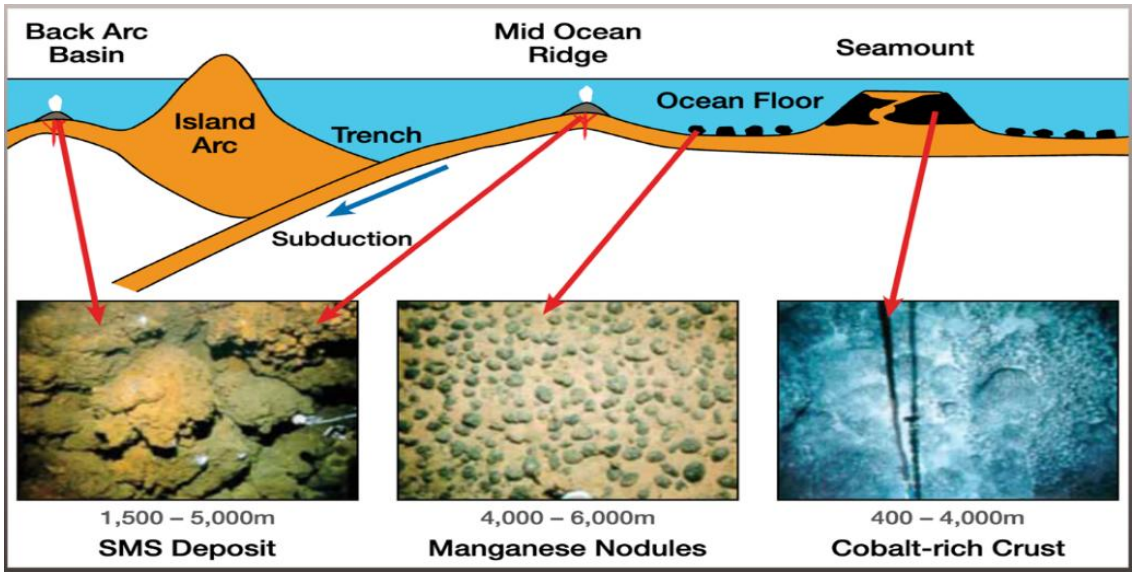

Figure One: *Formation and location of key deep-sea mineral types (SPC/SOPAC, "Deep Sea Minerals in the Pacific Islands Region: Brochure 3," 2013).*

[9] James Hein R. et al., "Deep-Ocean Polymetallic Nodules as a Resource for Critical Materials | Nature Reviews Earth & Environment," Nature Reviews Earth and Environment, February 24, 2020, https://www.nature.com/articles/s43017-020-0027-0.
[10] Epikhin et al., "Seabed Mining: A $20 Trillion Opportunity."
[11] R. E. Boschen et al., "Mining of Deep-Sea Seafloor Massive Sulphides: A Review of the Deposits, Their Benthic Communities, Impacts from Mining, Regulatory Frameworks and Management Strategies," *Ocean & Coastal Management* 84 (November 2013): 54–67, https://doi.org/10.1016/j.ocecoaman.2013.07.005.
[12] Boschen et al., "Mining of Deep-Sea Seafloor Massive Sulphides."
[13] Phillip Gales, "How Cobalt-Rich Crusts Form," Deep Sea Mining, accessed October 26, 2025, https://www.deepseamining.ac.
[14] Gales, "How Cobalt-Rich Crusts Form."

Economic incentives

Interest in DSM is accelerating as global demand increases for energy-transition metals (ETMs) essential to renewable-energy infrastructure and electric-vehicle production.[15] The CCZ is particularly significant, potentially containing more nickel and cobalt than all known terrestrial reserves.[16] The International Monetary Fund predicts that global demand for ETMs such as copper, nickel, cobalt, and lithium will surge fourfold over the next two decades, totalling USD 13 trillion windfall for producers.[17]

Russia's invasion of Ukraine triggered a short-squeeze that drove nickel prices up by more than 250 per cent due to short-term supply inelasticity, illustrating the volatility and vulnerability of supply chains in the ETMs market.[18] However, economic prosperity, especially when amounting to several trillions of dollars, can obscure important environmental considerations. Economic opportunities explain the momentum behind DSM exploration, but also increase pressures to exploit the seabed before the ecological standards are instituted.

Environmental issues

The key debate in the current literature is whether damage to marine ecosystems is less than that caused by terrestrial mining. Scholars caution that, given the incomplete data and differing ecological baselines, comparing biodiversity impacts between land and seabed ecosystems is fraught.[19] The most pertinent environmental challenge facing the DSM industry today is the lack of knowledge about DSM's true impact on benthic (sea-bottom) flora and fauna. Extracting the polymetallic nodules that serve as habitats for slow-growing benthic species, disturbs sediment over hundreds of square kilometres, and releases plumes

[15] Steven Katona et al., "Land and Deep-Sea Mining: The Challenges of Comparing Biodiversity Impacts | Biodiversity and Conservation," *Biodiversity and Conservation*, Biodiversity and Conservation, vol. 32 (March 2023): 1124-1126.
[16] Katona et al., "Land and Deep-Sea Mining: The Challenges of Comparing Biodiversity Impacts | Biodiversity and Conservation."
[17] Lukas Boer et al., *Energy Transition Metals*, Working Paper (International Monetary Fund, 2021), https://www.imf.org/en/Publications/WP/Issues/2021/10/12/Energy-Transition-Metals-465899. pp 5.
[18] Katona et al., "Land and Deep-Sea Mining: The Challenges of Comparing Biodiversity Impacts | Biodiversity and Conservation."
[19] Katona et al., "Land and Deep-Sea Mining: The Challenges of Comparing Biodiversity Impacts | Biodiversity and Conservation."

that may spread for tens of kilometres[20]. The long-term ecological effects of these processes remain poorly understood.[21]

Studies show deposit feeders and carnivorous benthic fauna exhibited minimal signs of recovery whereas infaunal predators (bivalves and crustacea) and mobile epifaunal carnivores (corals, barnacles, sponges) show partial signs of recovery one year after the end of seabed mining disturbance.[22] There are also concerns regarding noise and light, but these remain underdeveloped.[23] Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the International Tribunal for the Law of the Sea both maintain a cautionary approach to environmental management.[24] This aligns with Article 145 of UNCLOS, which obliges states and the ISA to ensure effective protection of the marine environment.

Any claim that DSM is environmentally cleaner than terrestrial mining is at best speculative.[25] Proponents advocating DSM as a greener alternative to terrestrial mining rest their argument on 20-76 percent lower carbon emissions in extracting ETMs over mining on land, no deforestation or Indigenous displacement, reduced toxic mine tailings, and an alternative to depending on of supply from China.[26]

While evidence of environmental degradation has rarely deterred great-power exploitation of a resource, Australia must prepare for a loosely regulated industry that may advance faster than the international frameworks designed to govern it. Sections two and three will

[20] Lisa A. Levin, "Significant, Serious and Sobering: Defining Serious Harm and Harmful Effects from Seabed Mining," Scripps Institution of Oceanography Deep-Ocean Stewardship Initiative, n.d., https://www.isa.org.jm/wp-content/uploads/2022/12/Levin.pdf. pp 250.
[21] Woolley SNC, Dunstan PK, Hosack GR, Fulton EA, Hyman J, Leduc D, O'Hara TD, Parr JM, Rowden AA, Schlacher TA, Dambacher JM, *Assessing the Quantitative Risk of Sea floor polymetallic Nodule Mining on Ecosystem indicators* (CSIRO Marine Laboratories, 2025), 1–2, https://research.csiro.au/dsm/wp-content/uploads/sites/569/2025/07/CSIRO-dsm-impact-modelling.pdf.
[22] Woolley SNC, Dunstan PK, Hosack GR, Fulton EA, Hyman J, Leduc D, O'Hara TD, Parr JM, Rowden AA, Schlacher TA, Dambacher JM, *Assessing the Quantitative Risk of Seafloor polymetallic Nodule Mining on Ecosystem indicators*. Pp 1-2, 32-33.
[23] A. Levin, "Significant, Serious and Sobering: Defining Serious Harm and Harmful Effects from Seabed Mining."
[24] Woolley SNC, Dunstan PK, Hosack GR, Fulton EA, Hyman J, Leduc D, O'Hara TD, Parr JM, Rowden AA, Schlacher TA, Dambacher JM, *Assessing the Quantitative Risk of Seafloor polymetallic Nodule Mining on Ecosystem indicators*; A. Levin, "Significant, Serious and Sobering: Defining Serious Harm and Harmful Effects from Seabed Mining."
[25] Katona et al., "Land and Deep-Sea Mining: The Challenges of Comparing Biodiversity Impacts | Biodiversity and Conservation."
[26] Scott Vincent, *A Deadly Moratorium* (Critical Ocean Minerals Research Centre, 2024), https://comrc.org/wp-content/uploads/2024/10/Deadly-Moratorium-for-Publication.pdf.

examine the legal and geostrategic dimensions and how Australia should respond.

Section Two: Legal Ambiguities

The legal framework governing DSM is struggling to keep pace with technological innovation and geostrategic competition. UNCLOS, designed in the 1970s, formalised in 1982, and ratified by Australia in November 1994, is now being tested. Rapid advancements in submersible technologies, the rising demand for ETMs, and increasing geostrategic competition between great powers make UNCLOS conceptually robust but operationally weak. This section examines the laws and institutions that shape activity in the international seabed, highlighting areas of fragility and contention. Understanding these dynamics is essential to understanding the regulatory pressures that will frame Australia's operating environment.

What is the current state of the law?

UNCLOS divides the ocean into maritime zones and determines sovereign rights and obligations. Article 3 of UNCLOS grants each coastal state a 12-nautical-mile sovereign territory measured from determined baselines, and including the airspace and seabed (Article 2). Part V of UNCLOS, particularly Article 57, creates an EEZ extending 200 nautical miles from the sovereign territory, including the sovereign rights to exploration and exploitation.

DSM is regulated by UNCLOS and its implementing body, the ISA. The ISA is the only body recognised under international law to issue licences for DSM operations in international waters. These licences can be issued to states or state-sponsored entities.[27] A state-sponsored entity being a private company, corporation, or other non-state actor which acts through a sponsoring state that is party to UNCLOS, as per Article 153 (2) (b).[28]

[27] Hannah Lily et al., *Enforcement of Deep-Sea Mining Regulations at Sea: Unpacking the Tangle of Overlapping Jurisdictions in International Waters*, White Paper (PEW Research Centre, 2024), 1–141, https://www.pew.org/en/research-and-analysis/white-papers/2024/02/enforcement-of-deep-sea-mining-regulations-unpacking-the-tangle-of-overlapping-jurisdictions.

[28] International Seabed Authority, *Information Brochure 15 The International Seabed Authority* (Secretariat of the Pacific Community, 2013), 1–8, https://dsm.gsd.spc.int/public/files/Deep%20Sea%20Min

Figure Two shows the significant overlap of DSM resources within EEZs in the Pacific.[29] The figure exposes the exploitation opportunities for Australia and the significance of DSM opportunities for Australia's Pacific partners. Most major deposits of polymetallic nodules, however, exist outside Australia's EEZ, in the CCZ and Pacific EEZ's. A large number of Pacific nations that have seabed-mining resources.

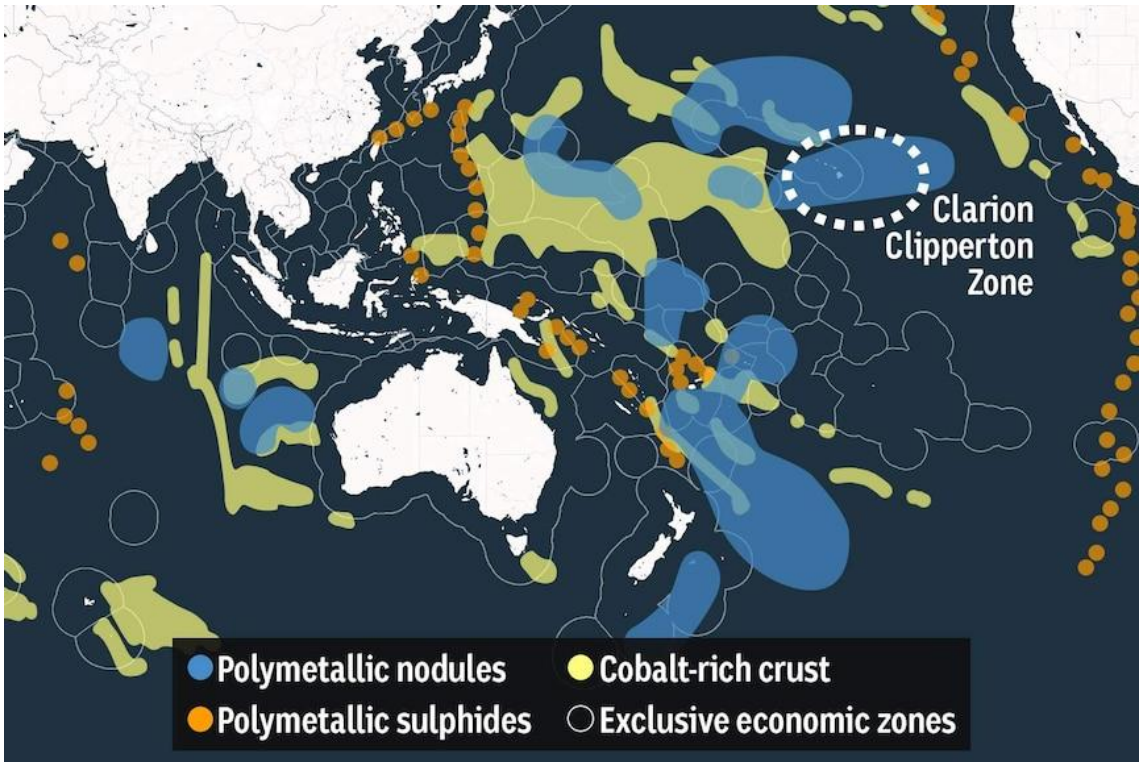

Figure Two: Distribution of polymetallic nodules, sulphides, and cobalt-rich crusts across the Indo-Pacific (ABC News, "Who's Finding These Metals, and Where?", 2019). Graphic created by: Jarrod Fankhauser.

Gaps and Ambiguities in the Current Framework

Article 145 is the key environmental safeguard which obliges the ISA to ensure the "effective protection of the marine environment from harmful effects" arising from seabed activities.[30] This obligation is both vague and difficult to enforce. There are no binding definitions for ecological damage or recovery, no independent inspection capacity, and

erals%20in%20the%20Pacific%20Islands%20Region%20Brochure%2015(1).pdf.
See also Annex III, Art 4(1) which notes Sponsoring States must ensure compliance with UNCLOS and ISA rules. See also, Annex III Art 4(3) which notes Sponsoring States must adopt domestic laws and oversight mechanisms to regulate their contractors.

[29] Alan Weedon, "How the Ocean Floor Is Changing War Strategy," *ABC News*, October 18, 2019, https://www.abc.net.au/news/2019-10-19/the-seabed-might-be-warfares-next-frontier/11606522.

[30] United Nations Convention on the Law of the Sea, opened for signature 10 December 1982, 1833 UNTS 397, art 145 (entered into force 16 November 1994).

limited public transparency.[31] While UNCLOS equips the ISA with certain responsibilities in a legal sense, little progress has been made in defining standards or enforcement methods.

The first and most crucial step in forming definitions is to expand and unpack the definition of 'serious harm to the marine environment' in line with the cautionary approach recommended by scholars in the field.[32] If not defined, some states may leverage the ISA's poor understanding of environmental safeguards and allow non-state actors to exploit the seabed in an unsustainable manner. Should such happen, Pacific Island countries' anticipating a sustainable and equitable 'Blue Pacific' or 'Blue Economy' may become frustrated with the rules-based system of UNCLOS and the ISA. Australia should therefore coordinate efforts to address the knowledge gaps and work on universal environmental standards that uphold the rules-based order.

Breakdown of international rules-based order in the maritime domain

The potential breakdown of the international rules-based order in the maritime domain is a serious threat to Australia's security. US President Donald Trump signed an executive order in April 2025 enabling the United States to grant unilateral DSM licences within its continental shelf and beyond, including the Area (international waters), bypassing ISA regulations.[33] America is not a party to UNCLOS and claims it is thefore not subject to Part XI of UNCLOS (regulating DSM) or customary international law.[34] Instead, the US is relying on its Deep Seabed Hard Mineral Resources Act of 1980.[35] According to Professor James Kraska, this argument may hold up.[36] The US has created an alternative to the ISA whereby it does not accept the 'common heritage of mankind' principle nor is it required to wait for ISA-issued DSM mining licences.[37] This is troubling for the Australia because the

[31] Aline Jaeckel, *The Implementation of the Precautionary Approach by the International Seabed Authority.*, Discussion Paper (International Seabed Authority, 2017).
[32] See Jaeckel; Katona et al; Levin et al; and Woolley SNC et al in Section 1 for this discussion.
[33] April Herlevi, "What Lies beneath: Trump and the Security of Subsea Cables | Lowy Institute," The Interpreter, accessed October 26, 2025, https://www.lowyinstitute.org/the-interpreter/what-lies-beneath-trump-security-subsea-cables.
[34] James Kraska, *The U.S. Executive Order on Seabed Mining Is Consistent with International Law*, 106 (2025): 500–423.
[35] "Unleashing America's Offshore Critical Minerals and Resources," The White House, April 24, 2025, https://www.whitehouse.gov/presidential-actions/2025/04/unleashing-americas-offshore-critical-minerals-and-resources/.
[36] Kraska, *The U.S. Executive Order on Seabed Mining Is Consistent with International Law*.
[37] Kraska, *The U.S. Executive Order on Seabed Mining Is Consistent with International Law*.

US is Australia's most powerful ally and its security guarantor. Australia may be torn between upholding the rules-based order or supporting the US, upon which it relies so heavily for security.[38] While Australia should support for DSM occuring with due regard to international law, the importance of the Australian-American alliance means Australia should proceed with caution and pragmatism.

International environmental treaty obligations

Another supplementary international law framework Australia should adhere to is the Agreement on Marine Biological Diversity of Areas Beyond National Jurisdiction (BBNJ).[39] Australia should also consider the Kunming–Montreal Global Biodiversity Framework (GBF) which is a non-binding policy framework that aims to protect 30 per cent of the world's oceans by 2030.[40] Because Australia is party to the Convention on Biological Diversity, it is automatically bound by the GBF. Australia is not yet bound by the BBNJ agreement as it has signed it but not ratified it. Australia has, nonetheless, signalled its intention to ratify the BBNJ as part of a comprehensive reform of environmental laws.[41]

Thus, if Australia were to proceed with DSM itself, it would be contrary to several international frameworks Australia has ratified or signed. Additionally and in concert with the Pacific Islands Forum, Australia has signed the Boe Declaration and has committed to the Paris Agreement on combatting climate change.[42] Australian DSM may adversely affect Australia's reputation as a defender of the rules-based international order and may worsen Australia's position on climate change issues. Australian DSM may damage relations with Pacific nations or invite increased coercion of Pacific nations from great powers such as

[38] Brendan Taylor, "Taiwan: What Could, Should and Will Australia do?," *The Washington Quarterly* 45, no. 3 (2022): 131–46, https://doi.org/10.1080/0163660X.2022.2126113. pp 2-4; Rebecca Strating and Joanne Wallis, *Girt by Sea: Re-Imagining Australia's Security*, 1st ed. (Black Inc., 2024), https://www.blackincbooks.com.au/books/girt-sea-0.
[39] United Nations. *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.* Opened for signature September 20, 2023. UN Doc A/CONF.232/2023/4 (not yet in force).
[40] Convention on Biological Diversity Conference of the Parties. *Kunming–Montreal Global Biodiversity Framework.* Decision 15/4, UN Doc CBD/COP/DEC/15/4 (adopted 19 December 2022).
[41] Australian Government - Department of Climate Change, Energy, the Environment and Water, "Nature Positive Plan: Better for the Environment, Better for Business - DCCEEW," Nature Positive Plan: Better for the Environment, Better for Business. https://www.dcceew.gov.au/environment/epbc/publications/nature-positive-plan.
[42] https://forumsec.org/sites/default/files/2024-03/BOE-document-Action-Plan.pdf

China. An increased Chinese presence in the Indo-Pacific will limit Australia's role, influence and status in the region.

Ultimately, the fragility of law at sea invites power politics. States exploit opportunities where legal uncertainty exist. The environmental and legal dimensions of DSM also have geostrategic implications, and indicate that that the seabed may be the next global flashpoint.

Section 3: Geostrategic opportunities and challenges

This section examines how DSM fits within the broader geostrategic environment, how it is reshaping power dynamics in the Pacific, and what the US and China are doing in the region. It begins by framing the importance of existing underwater domains in the Indo-Pacific.

Undersea cables and Pacific maritime traffic density

Figure Three shows the routes of global seabed cables. Figure Four indicates shipping routes in the Pacific Ocean. These two figures in concert expose the importance of the maritime domain and the overlap of physical (shipping) and virtual (data) sea lines of communication.

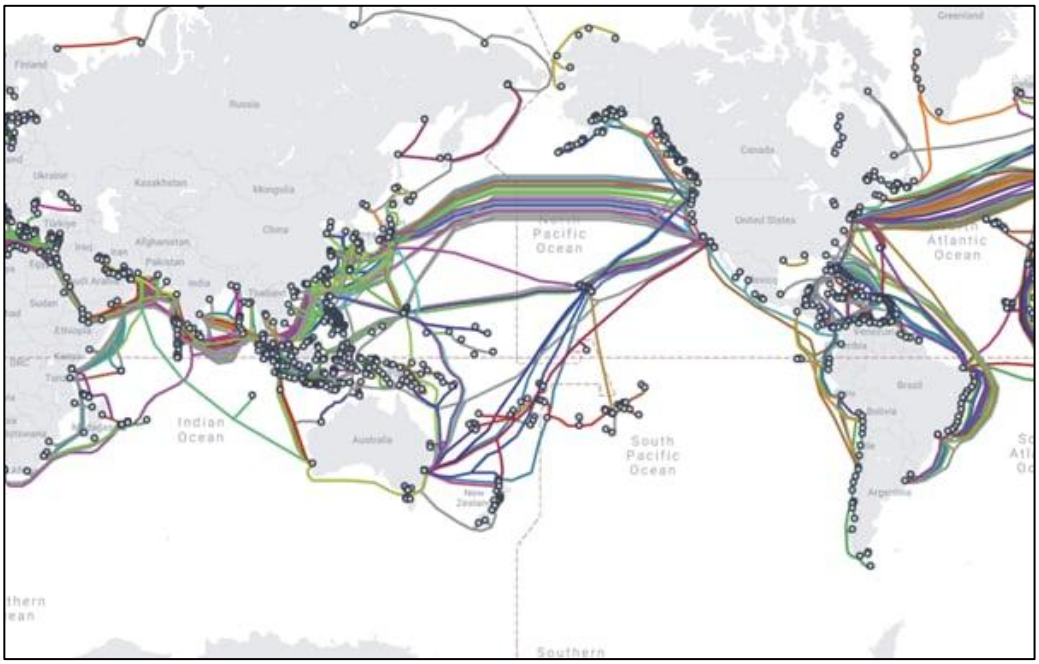

Figure Three: Global Submarine Cable Network (TeleGeography 2024, reproduced in PwC Australia, "The Subsea Cable State of Play: Unexpected Threats to Critical Infrastructure," 2024).

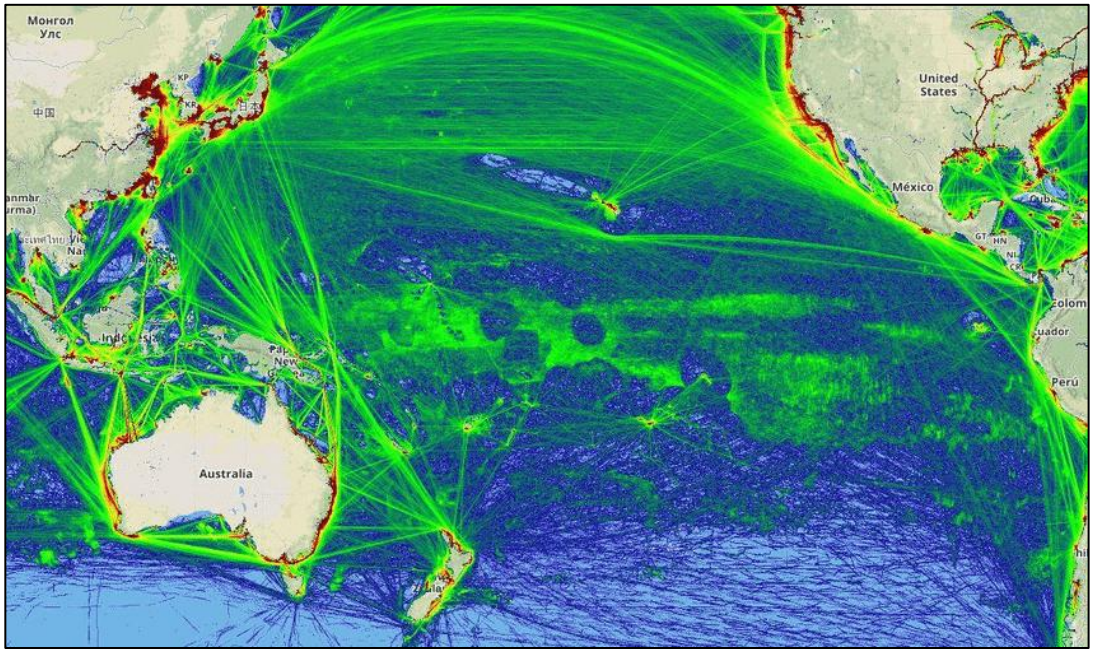

Figure Four: Maritime traffic density in the Pacific Ocean, 2015 (Source: MarineTraffic.com, reproduced in Govan et al 2017 Pacific Ocean Governance: Our Sea of Islands)

Key actors - China

Australia's primary trading partner and strategic concern is China. China already has significant market power in ETMs, having a quasi-monopoly on the supply and refinement of many critical minerals, and is a near-monopsony (single purchaser) for others.[43] China is the global-leading producer of 29 commodities, including 22 metals and seven industrial minerals.[44] China's dominance in mineral supply and purchase is a security threat for Australia.

Furthermore, China is signalling an increased interest in maritime matters beyond the first-island chain.[45] The *Tansuo Yi Hao* is a Chinese vessel in the Acoustics Department of the Peoples' Liberation Army Navy (PLAN). PLAN is reportedly building an intelligence and surveillance system to record the movement of adversarial vessels, and most concerningly, submarines.[46] This

[43] The Oxford Institute for Energy Studies, *Responding to the China Challenge: Diversification and de-Risking in New Energy Supply Chains*, Forum no. 142 (The Oxford Institute for Energy Studies, 2024), 47.
[44] Scott Vincent, *A Deadly Moratorium*.
[45] Toshi Yoshihara, "China's Vision of Its Seascape: The First Island Chain and Chinese Seapower," *Asian Politics & Policy* 4, no. 3 (2012): 293–314, https://doi.org/10.1111/j.1943-0787.2012.01349.x.
[46] Euan Graham and Ray Powell, "Seabed Sensors and Mapping: What China's Survey Ship Could Be up to," *The Strategist*, April 9, 2025, https://www.aspistrategist.org.au/seabed-sensors-and-mapping-what-chinas-survey-ship-could-be-up-to/.

development has caused Australia to increase cooperation with allies and exploit defence partnerships such as AUKUS and the QUAD to access acoustic and sonar technologies to keep pace with Chinese developments.

Deeply embedded in ISA decision-making, China is frequently cited as the largest financial contributor to the ISA.[47] In the absence of US endorsement of UNCLOS, China holds a quiet but real influence over ISA operations and voting dynamics.[48] This is seen in China's coercive practices in the South China Sea, and will extend into Pacific as China's maritime strategy expands.[49]

China maintains the largest number of ISA-sponsored exploration contracts in the Pacific and Indian Oceans.[50] According to Associate Professor Anna Powels, DSM is increasingly at the front-line of geopolitical competition in the Pacific.[51] China has signed a contract with the Cook Islands to explore its seabed mineral wealth and, following the collapse of talks between Kiribati and the US-backed The Metals Company, is reportedly negotiating with Kiribati. [52]

Thus, if the ISA-based framework for DSM mining licences prevails, China will be the most influential power under the regime. Should the balance of power in the Pacific lean further towards China, it would create new security issues for Australia. China's engagement with the Pacific and ISA regarding DSM may also consolidate its supremacy in critical mineral supply chains.

United States

The United States is Australia's most important ally and its security

[47] John Grady, "China Could Play Major Role in Drafting New Regulations for Seabed Mining, Says U.N. Official," UNSI News, accessed October 26, 2025, https://news.usni.org/2023/11/29/china-could-play-major-role-in-drafting-new-regulations-for-seabed-mining-says-u-n-official.
[48] Ting Yu et al., "Toward Ecosystem-Based Deep-Sea Governance: A Review of Global Approaches and China's Participation," *Marine Development* 3, no. 1 (2025): 1, https://doi.org/10.1007/s44312-024-00045-y. pp 10.
[49] Isaac B. Kardon and Sarah Camacho, "Why China, Not the United States, Is Making the Rules for Deep-Sea Mining | Carnegie Endowment for International Peace," December 19, 2023, https://carnegieendowment.org/research/2023/12/why-china-not-the-united-states-is-making-the-rules-for-deep-sea-mining?lang=en.
[50] Jessica Sier, "New Battleground in Critical Minerals Race Is on Australia's Doorstep," Australian Financial Review, April 28, 2025, https://www.afr.com/world/asia/new-battleground-in-critical-minerals-race-is-on-australia-s-doorstep-20250425-p5lu7r.
[51] Jessica Sier, "New Battleground in Critical Minerals Race Is on Australia's Doorstep."
[52] Australia-Pacific Islands Business Council, *Cook Islands Signs Strategic Deal with China*, February 27, 2025, https://apibc.org.au/2025/cook-islands-signs-strategic-deal-with-china/; Jessica Sier, "New Battleground in Critical Minerals Race Is on Australia's Doorstep."

guarantor. The US has been a contributor to and an observer of the ISA, but has not ratified UNCLOS.[53] US involvement in DSM is primarily tied to The Metals Company (TMC), a Canadian company that has invested significantly into DSM technology and exploration contracts in the Pacific. As of October 2025, TMC has US-supported exploration agreements with Nauru and Tonga.[54] Tthrough its subsidiary, Nauru Ocean Resources Inc, in 2022 TMC produced some positive findings regarding the viability of commercial extraction in the Clarion-Clipperton Zone (CCZ).[55] It successfully processed polymetallic nodules into calcine, requiring only one more round of processing to refine the calcine into nickel, cobalt, copper, and manganese ore.[56]

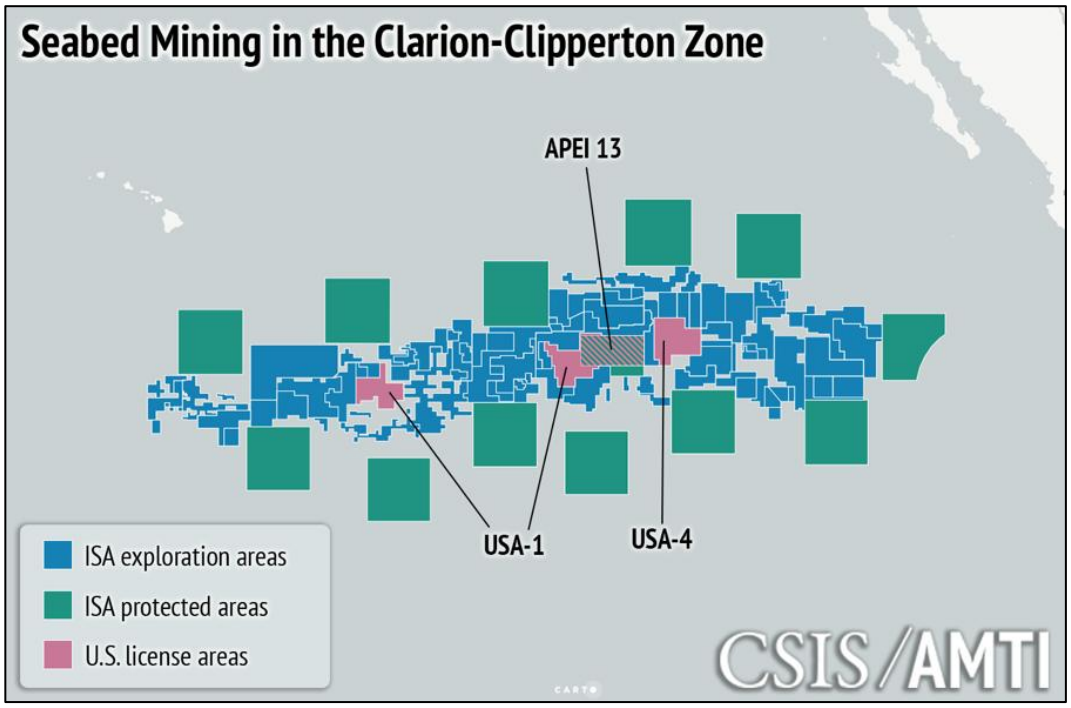

Figure Five: Seabed Mining in the Clarion–Clipperton Zone (Source: Center for Strategic and International Studies (CSIS) / Asia Maritime Transparency Initiative (AMTI), “Between Rocks and a Hard Place: Seabed Mining in the Pacific” (2024) https://amti.csis.org/between-rocks-and-a-hard-place-seabed-mining-in-the-pacific/)

[53] Leticia Reis de Carvalho Secretary-General of the ISA., “Statement on the US Executive Order:’ Unleashing America’s Offshore Critical Minerals and Resources’,” *Statement*, April 30, 2025, https://oeco.org.br/wp-content/uploads/2025/05/SG_Statement-on-the-US-Executive-Order-Unleashing-the-Offshore-Critical-Minerals-and-Resources-of-America.pdf.
[54] Teuila Fuatai, “The Metals Company Pushes Ahead with Deep Sea Mining Plans in Pacific Waters,” RNZ, August 28, 2025, https://www.rnz.co.nz/news/pacific/571303/the-metals-company-pushes-ahead-with-deep-sea-mining-plans-in-pacific-waters.
[55] Asia Maritime Transparency Initiative, *Between Rocks and a Hard Place: Seabed Mining in the Pacific*, May 29, 2025, https://amti.csis.org/between-rocks-and-a-hard-place-seabed-mining-in-the-pacific/.
[56] Asia Maritime Transparency Initiative, *Between Rocks and a Hard Place*.

Figure Five displays the various geographic boundaries of current exploratory mining licences in the CCZ. The US had formal control of USA-1 and USA-4 through Lockheed Martin. Lockheed Martin has since sold its seabed subsidiary to a Norwegian company in 2023.[57] Those two now-transferred mining licences were the US's only commitment to DSM through internationally recognised channels. The US also acts unilaterally, bypassing ISA regulations. ISA Secretary-General, Leticia Carvahlo, noted "any unilateral action… sets a dangerous precedent that could destabilize the entire system of global ocean governance".[58]

Nauru, backed by TMC, compelled the ISA to issue its first commercial mining licence.[59] However, in 2024, the ISA delayed its decision for an indefinite period.[60] With the ISA yet to grant any mining licences in international waters, the US has been driven to act unilaterally.

Ultimately, unilateral US actions only reinforce China's hold on the maritime rules-based international order and introduces significant ambiguity regarding Western influence in DSM operations and regulatory input. Australia should be prepared for American involvement in DSM to occur outside the rules-based domain—which will undoubtedly complicate how Australia interacts with Pacific nations and with the maritime rules-based order.

Pacific Islands

Pacific nations have taken two different stances on DSM. Tonga, Nauru, the Cook Islands and Kiribati are actively investigating DSM while other Pacific nations have refrained from action because of environmental concerns. DSM is fracturing the unity of Pacific Islands' consensus, and may have consequences for the equitable distribution of income from resources mined in international waters

[57] Asia Maritime Transparency Initiative, *Between Rocks and a Hard Place*.
[58] Leticia Reis de Carvalho Secretary-General of the ISA., "Statement on the US Executive Order:' Unleashing America's Offshore Critical Minerals and Resources'."
[59] Helen Reid, "Pacific Island of Nauru Sets Two-Year Deadline for U.N. Deep-Sea Mining Rules | Reuters," May 30, 2021, https://www.reuters.com/business/environment/pacific-island-nauru-sets-two-year-deadline-deep-sea-mining-rules-2021-06-29/.
[60] Gitanjali Bajaj et al., "Deep Sea Mining Uncovered: To Pause or Proceed? | DLA Piper," July 11, 2025, https://www.dlapiper.com/en-au/insights/publications/2025/07/deep-sea-mining-uncovered-part-three.

under the ISA's proposed financial distribution scheme.

As of October 2025, 38 countries have signed a moratorium on seabed mining, citing the risks DSM exposes and advocating that the gaps in scientific knowledge be filled before any extraction operations start.[61] Numerous private actors, such as Google and Volkswagen, have agreed not to use DSM-sourced materials in their products until the environmental sustainability of DSM is established.[62]

As previously mentioned, Tonga, Nauru, Cook Islands, and Kiribati are pro-seabed mining and hold significant investments in the hope of capitalising on an industry worth an estimated A$30 trillion.[63] This signals a split from other Pacific nations, for whom the uncertainty of the industry, and the significant capital expenditure required, is simply too great.[64] In 2022 Palau proposed the formation of an alliance to call for a moratorium on DSM. Fiji, American Samoa, the Federated States of Micronesia, Tuvalu, Vanuatu, the Marshall Islands and New Zealand joined it.[65]

Pacific Island countries may already have had concerns about DSM following 2011 failure of PNG's 'Nautilus' project. A mining licence was granted for Canada's Solawara 1 to extract DSM resources in PNG's EEZ.[66] However, the company entered into insolvency and Nautilus wound up costing PNG approximately US$120 million.[67] PNG has not signed up the Palau-initiated moratorium but will not conduct any DSM within its EEZ for the foreseeable future.[68]

This divide in Pacific nation attitudes to DSM (see Figure Six), and tension

[61] Deep Sea Conservation Coalition, *Momentum for a Moratorium*, n.d., https://deep-sea-conservation.org/solutions/no-deep-sea-mining/momentum-for-a-moratorium/.
[62] Elizabeth Levy, *Tesla Inc (TSLA) Vote Yes: Item #12 – Commit to a Moratorium on Deep Sea Sourced Minerals*, 2024, https://ir.tesla.com/_flysystem/s3/sec/000121465924007790/o429248px14a6g-gen.pdf.
[63] Epikhin et al., "Seabed Mining: A $20 Trillion Opportunity."
[64] Aline Jaeckel et al., "Deep Seabed Mining Lacks Social Legitimacy," *Npj Ocean Sustainability* 2, no. 1 (2023): 1, https://doi.org/10.1038/s44183-023-00009-7. Pp 3.
[65] Deep Sea Conservation Coalition, *Momentum for a Moratorium*.
[66] E.I. van Putten et al., "History Matters: Societal Acceptance of Deep-Sea Mining and Incipient Conflicts in Papua New Guinea.," *Maritime Studies* 22, no. 32 (2023): 1–17, https://doi.org/10.1007/s40152-023-00318-0.
[67] E.I. van Putten et al., "History Matters: Societal Acceptance of Deep-Sea Mining and Incipient Conflicts in Papua New Guinea."
[68] Aidan Craney and Kolaia Raisele, "The Pacific's United Front on Climate Action Is Splintering over Deep-Sea Mining," The Conversation, August 31, 2025, https://doi.org/10.64628/AA.7svvtfaps.

between environmental concerns and sovereign decision-making, are threatening the consensus that is a hallmark of the Pacific Islands Forum.[69] Furthermore, the fragmentation creates opportunities for great power coercion and interference in the Pacific. It may also limit Australia's ability to project soft power in the region as some Pacific nations become increasingly influenced by China and its support of DSM.[70] Australia should seek to closely monitor the developments of nations pursuing DSM in concert with foreign powers, particularly China, as they may have ripple effects on other aspects of Australia's attempts to remain the primary security guarantor of these nations, possibly requiring additional resources from Australia to match Chinese investment levels. Australia may be able to promote engagement in the Pacific by working with partners such as Japan, New Zealand, the UK and the US.[71] Doing so would reinforce Australia's leadership position and commitment to the security and development in the Pacific.

Country	External influencing actors
Cook Islands	**China (only a memorandum of understanding at this stage).**
Kiribati	**Exploring deals with China (TMC agreement collapsed.**
Nauru	**Canadian (TMC) with ties to America.**
Tonga	**Canadian (TMC) with ties to America.**
PNG	**Previously Canadian influence (company went into administration). PNG is now leaning closer to China.**

Figure Six: a summary of Pacific Island nations' positions on DSM which have external actors sponsoring exploration contracts. Based on the author's analysis based on publicly available information.

[69] Patrick Kaiku, "Deep Sea Mining—Can It Sink the Visions in Pacific Regionalism?," *Griffith Asia Institute's Regional Outlook*, Regional Outlook, no. No 72 (2022): 1–23.
[70] Ting Yu et al., "Toward Ecosystem-Based Deep-Sea Governance: A Review of Global Approaches and China's Participation.," *Marine Development* 3, no. 1 (2025): 1–14, https://doi.org/10.1007/s44312-024-00045-y.
[71] Australian Government Department of Foreign Affairs and Trade, "Joint Statement on the Announcement of the Partners in the Blue Pacific Initiative |," Media Release, June 25, 2022, https://www.dfat.gov.au/news/media-release/joint-statement-announcement-partners-blue-pacific-initiative.

Small island developing states stand to benefit from the ISA's equitable revenue sharing model. If commercial DSM is conducted via the ISA's licencing scheme (under Article 82 of UNCLOS), the ISA has a payment scheme for the exploitation of non-living resources in international waters.[72] The rate of payment contributions will increase each year until it is 7 percent of revenue. Per Article 82(2) of UNCLOS, small island developing states are priority beneficiaries of DSM. All thirty-eight small island developing states are self-elected into the category and all are signatories to UNCLOS, with the majority being Pacific Island nations.[73]

If the US's unilateral system of mining licences prevails over the ISA's international rules-based order, it may diminish the equitable financial distribution of mining revenues distributed to small island nations. Thus, it is in Australia's best interest to continue to promote the maritime rules-based order, and to support DSM in accordance with the ISA and UNCLOS, so that small island states receive income disbursements. Doing so may present challenges for Australia if the US decides to exert pressure on its allies to support its unilateral licencing scheme. However, Australia should support a scheme which financially benefits Pacific nations in a sustainable manner; thus enabling Australia to maintain regional relationships and to continue to project power in the Pacific and beyond.

3. CONCLUSION

Deep-sea Mining has caused the convergence of environmental uncertainty, legal ambiguity, and geostrategic competition. It is re-shaping the Indo-Pacific maritime order and the balance between ecological stewardship, alliance management, and national interest needs to be central to Australia's strategic posture moving forward.

Environmentally, the precautionary principle must remain central. Scientific uncertainty about the long-term effects of DSM on benthic ecosystems demands a cautionary approach. The environmental

[72] International Seabed Authority, *Small Island Developing States and the Law of the Sea: An Ocean of Opportunity* (International Seabed Authority, 2021), 4–36, https://www.isa.org.jm/wp-content/uploads/2022/06/SIDS_and_the_law_of_the_sea.pdf.

[73] United Nations, "List of SIDS," https://www.un.org/ohrlls/content/list-sids.

uncertainties of DSM are also the main drivers of tension in the legal and geostrategic dimensions.

Legally, UNCLOS remains the cornerstone of maritime governance, but its ability to regulate DSM is eroding under technological, environmental, and geostrategic strain. The ISA's slow progress on regulation and America's unilateralism expose structural weaknesses in the rules-based order. For a maritime nation dependant on predictable norms, Australia should champion the rules-based approach to DSM even though the US is disregarding it because the credibility of UNCLOS safeguards Australia's maritime sovereignty and alliances.

Geo-strategically, DSM is already fracturing Pacific relations and deepening great-power rivalries. China's expanding ISA-based influence and America's extra-legal assertiveness both risk marginalising smaller Pacific states. Australia's credibility as a regional leader ultimately hinges on balancing alliance pragmatism with regional solidarity, ensuring the Pacific does not dissolve into a great-power contest.

4. RECOMMENDATIONS

1. Maintain commitment to the maritime rules-based order by supporting the ISA's regulatory framework.

2. Prepare operational plans to respond to unilateral mining or coercive activity by major powers.

3. With regional partners, invest in: multidisciplinary research into seabed ecosystems; monitoring mining impacts; influencing policy regionally and internationally; and advancing scientific understanding of underwater domain.

4. Use joint patrols, shared seabed surveillance, and international maritime law advocacy to enhance Pacific partnerships.

To maintain commitment to the maritime rules-based order, it is essential to support the ISA's regulatory framework while preparing operational plans to address unilateral mining or coercive activities by major powers. Collaborating with regional partners, we should invest in multidisciplinary research into seabed

ecosystems, monitor mining impacts, influence policy at both regional and international levels, and advance scientific understanding of the underwater domain. Additionally, employing joint patrols, shared seabed surveillance, and advocating for international maritime law can further enhance partnerships across the Pacific.

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