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Research Article

Melting Boundaries: Navigating Competing Interests for Deep-Sea Mining in the Arctic

Veronica Leonard*

Abstract: As Arctic ice recedes, previously inaccessible seabed resources are becoming increasingly viable for extraction, drawing global attention to deep-sea mining (DSM) in the region. This article examines the evolving legal landscape of DSM in the Arctic, which is fragmented and shaped by competing national interests, unresolved territorial claims, and differing commitments to international law. As the Arctic coastal states weigh the economic potential of DSM against environmental and geopolitical concerns, the region remains a contested space where law, policy, and strategic interests continue to evolve. This article begins with an overview of the international regulatory framework, including the *United Nations Convention on the Law of the Sea* (UNCLOS), the International Seabed Authority, and key regional agreements such as the Arctic Council's guidelines. It then provides an in-depth analysis of the DSM policies of the five Arctic coastal state—Canada, Denmark (Greenland), Norway, Russia, and the United States—assessing how each state's approach is shaped by its political priorities, legal commitments, and strategic interests. A comparative discussion explores how these states navigate their obligations under UNCLOS, their extended continental shelf claims, and their broader geopolitical strategies. Additionally, the article considers the growing interest of non-Arctic states, particularly China, in Arctic deep-sea mining, highlighting the broader international implications of resource development in the region.

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Article de Recherche

Dissolution des frontières : Gestion des intérêts concurrents pour l'exploitation minière des fonds marins arctiques

Veronica Leonard*

Résumé : À mesure que la glace arctique recule, des ressources autrefois inaccessibles deviennent de plus en plus exploitables, attirant l'attention mondiale sur l'exploitation minière des grands fonds marins dans la région. Cet article examine le paysage juridique en évolution de cette exploitation, fragmenté et façonné par des intérêts nationaux concurrents, des revendications territoriales non résolues et des engagements différenciés envers le droit international. Alors que les États côtiers arctiques évaluent le potentiel économique de l'exploitation des fonds marins arctiques face aux préoccupations environnementales et géopolitiques, la région demeure un espace contesté où le droit, les politiques et les intérêts stratégiques continuent d'évoluer. L'article débute par un aperçu du cadre réglementaire international, incluant la Convention des Nations Unies sur le droit de la mer (CNUDM), l'Autorité internationale des fonds marins (AIFM) et les accords régionaux clés tels que les directives du Conseil de l'Arctique. Il propose ensuite une analyse approfondie des politiques d'exploitation des grands fonds marins des cinq États côtiers arctiques — Canada, Danemark (Groenland), Norvège, Russie, et États-Unis — évaluant comment l'approche de chacun est façonnée par ses priorités politiques, engagements légaux et intérêts stratégiques. Une discussion comparative explore comment ces États naviguent leurs obligations sous la CNUDM, leurs revendications de plateau continental étendu (PCE) et leurs stratégies politiques plus larges. Enfin, l'article aborde l'intérêt croissant des États non arctiques, particulièrement la Chine, pour l'exploitation des grands fonds marins, mettant en lumière les implications internationales plus larges du développement des ressources dans la région.

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Part I. Introduction

The world is shifting from fossil fuels to carbon neutral energy sources like hydroelectric, solar, and wind. According to Natural Resources Canada, wind and solar energy are the fastest growing sources of electricity in the country.[1] Vehicles are moving from gas powered to electric; in 2023, one in four new cars sold globally was electric.[2] These green technologies, however, require vast quantities of critical minerals like lithium, cobalt, manganese, and copper. Producing a single electric vehicle requires over 100 kilograms of graphite and copper alone.[3] With global demand for critical minerals projected to triple by 2030 and quadruple by 2040, securing these resources has become a global priority.[4]

The Arctic holds abundant deposits of critical minerals, including rare earth elements, nickel, copper, and cobalt. Some estimate that almost 90% of the world's nickel and cobalt, and 60% of the world's copper, are in the Arctic.[5] While significant reserves exist on land, climate change is also opening new opportunities offshore. As the Arctic Ocean's polar ice cap rapidly melts, previously inaccessible areas of the seabed are becoming available for exploration and deep-sea mining (DSM), which is the extraction of valuable minerals found in polymetallic nodules, ferromanganese crusts, and polymetallic massive sulphides on the seafloor, thousands of metres below the ocean's surface.[6] Notably, polymetallic nodules are potato-sized mineral deposits on the seafloor that are rich in essential metals like manganese, nickel, cobalt, copper, titanium, and rare earth elements.[7]

The Arctic's increasing accessibility has prompted the Arctic coastal states—Canada, Denmark, Norway, Russia, and the United States—to coordinate efforts in asserting jurisdiction over strategic areas of the Arctic Ocean to strengthen their global critical mineral position through increased access to DSM. This shared interest in resource management has heightened the importance of clearly defined territorial claims and reinforced the need for continued international cooperation in the region. This article examines the distinct approaches of the five Arctic coastal states to DSM by comparing their legal frameworks and geopolitical strategies, shedding light on how each nation is positioning itself in this rapidly evolving landscape. First, the international legal framework of deep-sea mining is discussed in detail.

Part II. International Legal Landscape

United Nations Convention on the Law of the Sea

The *United Nations Convention on the Law of the Sea* (UNCLOS) is the international framework governing maritime activities, including those in the Arctic Ocean.[8] UNCLOS divides the world's oceans into different maritime zones, each granting coastal states rights and responsibilities. Roughly 80% of the Arctic Ocean, and over 99% of its seabed, lie within areas under the jurisdiction or pending claims of at least one Arctic coastal state.[9] It is therefore necessary to understand the rights associated with each maritime zone before examining how Arctic states have sought to extend their jurisdiction over additional seabed areas, and their individual approaches to regulating deep-sea mining within and beyond national boundaries.

The maritime zones defined in UNCLOS include the territorial sea, the exclusive economic zone, and the continental shelf. The territorial sea extends up to 12 nautical miles from a coastal state's baseline, where the state exercises full sovereignty, subject to certain navigation rights for other countries.[10] Beyond this, the exclusive economic zone extends up to 200 nautical miles, granting coastal states exclusive rights to the seabed and the water above, although international navigation and overflight rights remain intact.[11]

The legal entitlements of the continental shelf extend 200 nautical miles from a state's baseline, granting the state sovereign rights to exploit seabed resources.[12] Under Article 76 of UNCLOS, states can claim an extended continental shelf beyond 200 nautical miles, provided they present scientific and geological evidence that the seabed is a prolongation of their landmass.[13] Extended continental shelf claims can extend up to 350 nautical miles (or even further if the seabed feature is a natural prolongation).[14]

States must submit extended continental shelf claims to the Commission on the Limits of the Continental Shelf (CLCS), which evaluates the claim's scientific and technical merits.[15] While the CLCS provides recommendations on the outer limits of the continental shelf, it does not resolve disputes between states about overlapping claims.[16] Examples of these disputes in the Arctic include the overlapping claims to the Lomonosov Ridge and Mendeleev Ridge, which are seafloor areas rich in critical minerals.[17] There has also been debate as to whether these areas qualify as submarine ridges or submarine elevations.[18] The extended continental shelf limit for submarine ridges, capped at 350 nautical miles, does not apply to submarine elevations (such as plateaux andrises), which are considered natural extensions of the continental shelf.[19]

The International Seabed Authority

Beyond the continental shelf, UNCLOS designates the deep seabed in areas beyond national jurisdiction—"the Area"—as part of the "common heritage of mankind."[20] This means that no single country can claim or exploit it unilaterally. Instead, activities in the Area are regulated by the International Seabed Authority (ISA), an autonomous organization established under UNCLOS with its headquarters in Jamaica.[21] The ISA is responsible for managing and regulating mining activities in the Area, ensuring that resource extraction is sustainable, and is done for the benefit of humanity as a whole.[22] The ISA manages the exploration and potential exploitation of mineral resources in the Area.[23]

However, the ISA has yet to finalize comprehensive regulations for deep-sea mining, leading to uncertainty about how DSM activities will be governed. In 2021, the Republic of Nauru, acting on behalf of the Nauru registered company NORI, which is a wholly-owned subsidiary of The Metals Company (TMC) headquartered in Canada, triggered the "two-year rule," which gives the ISA two years to establish DSM regulations before mining applications would be processed without internationally agreed-upon standards.[24] This deadline has now passed, suggesting that countries and their sponsored entities (like TMC) could start applying for DSM licences without internationally agreed-upon standards.[25]

While the ISA governs deep-sea mining in the Area, most of the Arctic Ocean's potential DSM activity could occur within coastal states' continental shelves or extended continental shelves, where the ISA's role diminishes. Nonetheless, disputes over extended continental shelf boundaries and the increasing interest in DSM bring the ISA into Arctic geopolitics.

In addition to UNCLOS, the Arctic Ocean is governed by a complex array of multilateral agreements and regional laws. Some of these, particularly those with the most uncertain application regarding DSM, are explored below.

The Arctic Council

The Arctic Council is an intergovernmental forum promoting collaboration on sustainable development, environmental protection, and Indigenous rights in the Arctic.[26] It consists of eight states: the five Arctic coastal states plus Sweden, Finland, and Iceland. It also includes Indigenous Permanent Participants with full consultation rights.[27] The Arctic Council affirms the states' "commitment to the protection of the Arctic environment, including the … conservation and sustainable use of natural resources."[28] The Council facilitates collaboration on Arctic-specific issues, including research and environmental monitoring, focusing on non-binding, consensus-based agreements.[29]

While the Arctic Council has been effective in fostering dialogue and managing soft law agreements, it lacks regulatory authority over issues such as military activities or resource extraction. Additionally, while it has provided guidance for onshore Arctic mining through initiatives such as the ongoing Mainstreaming of Biodiversity in Arctic Mining project, it has not addressed offshore mining.[30] The Protection of the Arctic Marine Environment Working Group has expanded its research topics to include offshore and coastal mining and is developing an initiative to identify best practices for DSM waste disposal.[31] However, the Arctic Council offers non-binding guidelines and recommendations. As Arctic coastal states compete for extended continental shelves and explore potential DSM activities, the lack of regulatory oversight within the Council leaves these developments governed by a patchwork of national policies and international law that is often not specific to the Arctic.

Finally, the Council's efficacy is limited by the cooperation of all states. For example, Russia's invasion of Ukraine has disrupted the Arctic Council, with the remaining seven states pausing collaboration with Russia, in protest of Russia's actions in protest of Russia's actions.[32] This pause has stalled critical initiatives on environmental protection, sustainable development, and scientific research in the Arctic, creating uncertainty about the Council's future effectiveness and cohesion.

Ilulissat Declaration

The Ilulissat Declaration (the Declaration), signed in 2008 by the five Arctic coastal states, reaffirmed their commitment to the existing "comprehensive international legal framework" to govern the Arctic, and asserted that no new framework was necessary.[33] It emphasized the shared responsibility of these states to manage the Arctic Ocean sustainably, including resource exploitation like deep-sea mining, and reinforced their commitment to the orderly settlement of territorial claims. It also highlighted the importance of sharing scientific information, particularly regarding the continental shelf.[34]

However, the Declaration was also controversial. Only the five littoral (coastal) states were signatories, excluding non-coastal Arctic states and Indigenous Peoples. The Inuit Circumpolar Council highlighted that the Declaration neglected existing international frameworks designed to safeguard Indigenous rights and did not sufficiently engage Inuit rights holders.[35] Iceland cautioned that stratification between the Arctic states did not acknowledge the commonality of non-littoral Arctic states.[36] Consequently, the Declaration reinforced the primacy of the Arctic coastal states in determining maritime boundaries and resource rights. Its release coincided with growing interest in Arctic resources and increased accessibility due to climate change, leading some to question its intent.[37]

The Declaration makes no explicit reference to deep-sea mining. If interpreted as adherence to UNCLOS, it theoretically has no impact on DSM in the Arctic. However, the United States has not ratified UNCLOS, largely due to its objections to UNCLOS's framework for DSM. Uncertainty persists regarding the extent to which the United States considers those provisions binding in Arctic waters. This ambiguity has become more pronounced following the April 2025 presidential executive order directing federal agencies to "expedite the process for reviewing and issuing seabed mineral exploration licenses and commercial recovery permits in areas beyond national jurisdiction" under domestic law.[38] The U.S. consideration of an application from TMC, The Metals Company, under this framework suggests a move toward a unilateral licensing regime that could bypass the International Seabed Authority, raising questions about U.S. alignment with international norms and cooperative governance in the region.[39]

While reaffirming existing frameworks, the Declaration effectively prioritizes Arctic coastal states. Excluding non-coastal, and non-Arctic, states and Indigenous voices raises concerns about the willingness of Arctic coastal states to engage in meaningful international collaboration.

Agreement on Enhancing International Arctic Scientific Cooperation

The *Agreement on Enhancing International Arctic Scientific Cooperation*, signed at the 2017 Arctic Council ministerial meeting in Fairbanks, aims to facilitate scientific research in the Arctic by improving access to research areas, infrastructure, and data among the Arctic states.[40] While the agreement does not mention DSM or resource extraction explicitly, Article 6 encourages states to allow access to "identified geographic areas," which includes states' continental shelves and imaging of the Area (beyond national jurisdiction), for scientific purposes.[41] Article 6(2) emphasizes cooperation in processing marine scientific research applications.[42] This supports granting exploration licences for DSM in the Arctic, a necessary precursor to exploitation, to assess ecological impacts and feasibility. Increased scientific access could contribute to baseline data for potential governance of the Area under the eventual ISA framework.

Espoo Convention

The *Convention on Environmental Impact Assessment in a Transboundary Context*, colloquially named the Espoo Convention, or Espoo, obliges parties to assess the environmental impact of certain activities that might have cross-border effects, and to notify and consult affected neighbouring states before approving such projects.[43] Mining is among the regulated activities, and this presumably includes deep-sea mining.[44] The Espoo Convention aims to prevent environmental harm

and foster international cooperation in decision making. While all eight Arctic states have signed, Iceland, Russia, and the United States have not ratified it.[45]

DSM in the Arctic or international waters would have transboundary environmental effects, such as sediment plumes, disruption of migratory species, and deep-sea ecosystem damage.[46] Under Espoo, such activities would require: (1) rigorous environmental assessments before any mining begins; and (2) notification and consultation with neighbouring states, which could include Arctic Council members or other affected states.[47] Proposed DSM projects by countries party to Espoo would also need to comply with the pre-project assessment requirements set out in the Strategic Environmental Assessment Protocol developed under Espoo.[48]

The OSPAR Convention

The OSPAR Convention, formally the *Convention for the Protection of the Marine Environment of the North-East Atlantic*, aims to safeguard marine ecosystems through measures to prevent pollution and protect biodiversity.[49] Adopted in 1992, it applies only to the Arctic waters of Norway, Iceland, and Denmark.[50] It sets high environmental standards for pollution from dumping, but it is uncertain whether DSM waste disposal falls under its definition of dumping or any exceptions in its Annex II.[51] Additionally, its influence on deep-sea mining in international waters or areas beyond its geographical scope is limited to voluntary adoption of its principles as best practices.

Central Arctic Ocean Fisheries Agreement

Several environmental agreements pertain to deep-sea mining in the Arctic Ocean, with varying relevance. The *Central Arctic Ocean Fisheries Agreement* (CAOFA) is particularly significant. The CAOFA, which came into force June 2021, aims to prevent unregulated fishing in the Central Arctic Ocean.[52] Signed by ten parties, including all five Arctic coastal states plus China, Iceland, and others, the CAOFA establishes a sixteen-year moratorium on commercial fishing in the region to facilitate scientific research on the region's biodiversity and assess the potential for sustainable fisheries management.[53] The CAOFA illustrates a constructive response from the five Arctic states to backlash from the Ilulissat Declaration, this time including Indigenous voices and inviting non-Arctic participation.[54]

The CAOFA could serve as useful precedent for a binding DSM agreement between the Arctic (and even non-Arctic) states. It provides a model for adopting precautionary moratoria in under-researched resource sectors such as the emerging DSM sector. Additionally, the CAOFA can be used as precedent for a sectoral, legally binding DSM treaty for the Arctic Ocean among coastal and non-coastal states. It further demonstrates how non-binding declarations, like the precursing Ilulissat Declaration in this case, can evolve into binding multilateral instruments.[55]

Finally, the CAOFA's focus on ecosystem protection can be tied to concerns about DSM's environmental impacts. Deep-sea mining would contribute to the cumulative effects that threaten fish ecosystem resilience.[56] Disruption from deep-sea mining could undermine the long-term fishing potential the CAOFA seeks to preserve.

Biodiversity Beyond National Jurisdiction Agreement

Adopted in 2023, the *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* (BBNJA) is a landmark treaty under the United Nations framework aimed at conserving and sustainably using marine biodiversity in areas beyond national jurisdiction such as the high seas and the Area.[57] The sixtieth ratification was obtained on September 19, 2025, and came into force on January 17, 2026.[58]

While it will not change states' rights or obligations within their jurisdictions, including on their extended continental shelves, the BBNJA creates uncertainty about its application to the waters above a country's extended continental shelves, which remain part of the high seas.[59] For example, parts of Norway's proposed DSM sites, like the Banana Hole, lie on its alleged extended continental shelf,[60] raising questions about whether deep-sea mining activities impacting fish stocks or ecosystems in the overlying water column (water above sediments) could contravene the BBNJA, or other agreements like Espoo or the CAOFA. This uncertainty highlights potential conflicts between deep-sea mining operations and emerging biodiversity protections in shared marine environments.

The BBNJA's application should not "undermine" existing international legal regimes, indicating that it is likely subordinate to the International Seabed Authority, who retain primary authority over activities on the seabed beyond national jurisdiction.[61]

Part III. The Approaches of Arctic States to Deep-Sea Mining

Having explored the international legal landscape, this section examines each Arctic coastal state's deep-sea mining policies and objectives. The five Arctic coastal states—Canada, Denmark, Norway, Russia, and the United States—each approach DSM through the unique context of their political landscape, international commitments, and domestic frameworks.

The discussion explores each state's stance on deep-sea mining both within their jurisdiction and in areas beyond national jurisdiction, and includes their strategic objectives and legal structures governing these activities. The relationship of states with UNCLOS, other international or regional law, and their extended continental shelf claims will also be considered. This analysis provides a comprehensive understanding of how deep-sea mining aligns with the geopolitical, legal, and environmental objectives of the Arctic coastal states.

Canada

Canada's presence in the Arctic has increasingly been defined by proactive leadership in pragmatic diplomacy, regional governance, and cooperation with allies.[62] Deep-sea mining has not been a priority for Canada, which has instead focused its Arctic attentions on claiming the Northwest Passage as internal waters to control its usage.[63] Delineating its Arctic Ocean boundaries is one of Canada's highest priorities.[64]

There is a stark lack of legislation in Canada governing offshore mining. Generally, provinces have constitutional jurisdiction over natural resources on provincial Crown land.[65] The three northern territories (the Yukon, Northwest Territories, and Nunavut), however, do not have constitutional jurisdiction; their powers come from delegated authority under federal statutes.[66] The territories do have control over land-based mining in the Arctic.[67] However, when it comes to offshore mining, the federal government holds primary responsibility.[68] The *Oceans Act* confirms federal jurisdiction over the territorial sea, the exclusive economic zone, and the continental shelf.[69] While the *Petroleum Resources Act* governs oil and gas interests and gives the federal government jurisdiction over offshore interests in the Arctic, Canada lacks federal laws for issuing offshore mining rights, creating a regulatory vacuum in this emerging sector.[70] Canada will not authorize DSM in its waters until such a regulatory regime is established.[71]

Canada's robust framework for Indigenous consultation presents further challenges for Arctic DSM.[72] The constitutional duty to consult requires the Crown to engage with Indigenous groups whenever projects may impact claimed or recognized Aboriginal rights or titles.[73] Many potential DSM sites within Canada's Arctic exclusive economic zone overlap with regions traditionally used by Indigenous communities for hunting, fishing, and other cultural practices, impacting their Indigenous and treaty rights, including marine rights. This potential impact triggers the duty to consult and necessitates addressing potential disruptions while ensuring equitable benefits for Indigenous rights holders. The leading case on Indigenous consultation for offshore resource development projects, particularly in the Arctic, is Clyde River.[74] That case involved approval for offshore seismic testing in the Arctic.[75] The Supreme Court of Canada held that the National Energy Board failed to properly consult Inuit communities and quashed the project authorization.[76] Additionally, several Federal Court cases confirm the Crown's obligation to consult when there are potential implications of project development on Indigenous marine rights.[77] This legal complexity and uncertainty does not favour Canada in pursuing Arctic DSM, especially compared to the position of some of its Arctic neighbours.

Canada ratified UNCLOS in 2003 and submitted its extended continental shelf claim in 2019, with its addendum submitted in 2022.[78] In its submission, Canada claims the Lomonosov Ridge, Alpha Ridge, and Mendeleev Rise, with the intervening Podvodnikov Basin and Makarov Basin. Canada bases its claim on the argument that the submarine elevations in this region "trend roughly parallel to the Canadian Arctic Archipelago margin."[79] This claim has yet to be fully processed by the Commission on the Limits of the Continental Shelf. Canada is also among the countries advocating for a moratorium on deep-sea mining due to environmental and sustainability concerns.[80]

The Canadian government currently supports moratoriums on both deep-sea mining in international waters and on offshore oil and gas developments in its Arctic waters.[81] However, while Canada's official stance favours a moratorium on deep-sea mining, The Metals Company (TMC, the DSM pioneer headquartered in Canada), is aggressively pursuing permits to begin mining. Despite its Canadian origins, TMC operates outside Canadian jurisdiction through subsidiaries and strategic partnerships with other countries, most notably Nauru, which first triggered the "two-year rule"[82] (as mentioned above).

TMC is attempting to circumvent international regulations by submitting its application for mining in the Area to the United States, instead of to the International Seabed Authority.[83] Should TMC violate international maritime law in bypassing the ISA's authority, Canada could face legal repercussions under Article 139 of UNCLOS, which holds states responsible for ensuring entities under their jurisdiction comply with international obligations.[84]

Aside from this apparent contradiction, Canada has taken a notably proactive approach to Arctic diplomacy, prioritizing peaceful boundary resolution and legal clarity in contested waters. In 2022, Canada and Denmark (via Greenland) resolved a longstanding Arctic dispute, agreeing on a modernized maritime boundary,

stretching from the Lincoln Sea to the Labrador Sea and dividing the Arctic island Tartupaluk (Hans Island).[85] Canada is engaged in similar negotiations to delineate Arctic maritime boundaries with the United States.[86]

Without a "rigorous regulatory structure," Canada will not authorize deep-sea mining within its waters.[87] DSM in the Canadian Arctic remains unlikely in the foreseeable future given environmental concerns, political considerations, regulatory gaps, and the overlap of potential mining sites with Indigenous territories. However, uncertainty persists regarding how Canada will respond to Canadian-based companies commencing DSM in the Arctic's areas beyond national jurisdiction. This disjunction between Canada's stated opposition to deep-sea mining and the actions of private Canadian entities exposes a degree of policy incoherence, one that complicates Canada's image as a state committed to principled, rules-based ocean governance.

Denmark

Denmark's approach to deep-sea mining in the Arctic is shaped by its unique relationship with Greenland, a semi-autonomous mostly-Arctic territory with extensive natural resources. Greenland has been granted considerable autonomy over its natural resources. In 2009, Greenland took full control over its mineral resources through the *Self-Government Act*.[88] While Denmark retains responsibility for representing Greenland in international forums, like the ISA, Greenland largely determines its own policies on resource management. Denmark's broader stance aligns with the Nordic Council, which advocates for sustainable development and environmental protection in the Arctic.

The *Greenland Parliament Act on Mineral Activities* (GPAMA) came into force in 2024, replacing the *Mineral Resources Act* as the governing framework for mineral exploration and exploitation.[89] The GPAMA not only dictates the regulatory framework for terrestrial mining but applies to the exploration and exploitation of seabed resources in Greenland's exclusive economic zone and continental shelf.[90] The GPAMA establishes state ownership of minerals, licensing regimes for the different stages of mineral extraction (from prospecting to exploitation), and environmental and social responsibility.[91] The licence holder is liable for environmental damage and is required to conduct an environmental impact assessment.[92] Unique from other Arctic States' mining requirements is Greenland's requirement for proponents to submit a social impact assessment.[93]

Denmark has expressed disapproval of deep-sea mining, adding its name in 2024 to the list of countries supporting a global DSM moratorium.[94] This aligns with the Nordic Council's resolution, passed the same year, advocating for a halt on DSM activities.[95] Greenland's stance on DSM is less explicit but can be inferred to follow its Act on mineral activities, which emphasizes sustainability and responsibility in resource development.

In 2009, Denmark (on behalf of Greenland) submitted a preliminary submission to the Commission on the Limits of the Continental Shelf regarding Greenland's extended continental shelf in the Arctic.[96] The CLCS provided recommendations to Denmark in 2014, recognizing all submitted areas as part of the continental shelf (including the contentious Lomonosov Ridge and Alpha Ridge), but without resolving overlapping claims.[97]

While Denmark's stance on deep-sea mining focuses on prevention through its support for a moratorium, Greenland retains the legal authority to pursue DSM activities within its exclusive economic zone and continental shelf under the *Greenland Parliament Act on Mineral Activities*. However, Greenland is unlikely to pursue DSM anytime soon. The requirements for comprehensive environmental impact assessments and social impact assessments, coupled with geopolitical complexities and overlapping extended continental shelf claims, suggests that any DSM initiatives will face significant regulatory and political hurdles.

Norway

Norway's approach to deep-sea mining in the Arctic is rapidly evolving. In January 2024, the Norwegian government agreed to open 281,000 square kilometres of its continental shelf for DSM exploration and exploitation, becoming the first Arctic state to accept applications for DSM licences on their continental shelf.[98]

This decision generated both domestic and international political scrutiny. Environmental groups and the Norwegian Socialist Left Party were quick to voice their objections.[99] In February 2024, the European Parliament voted in favour of *Resolution B9-0095/2024*, voicing the European Union's concerns about Norway's DSM pursuit.[100] The resolution highlighted environmental concerns and Norway's existing legal obligations. As a signatory to the Espoo Convention and the Strategic Environmental Assessment Protocol, Norway is obligated to avoid significant transboundary impacts.[101] Additionally, as seen above, Norway must protect the marine environment under OSPAR, the *Convention for the Protection of the Marine Environment of the North-East Atlantic*.[102] In response to mounting pressure, largely from the Socialist Left Party, Norway paused its first DSM licensing round until the September 2025 parliamentary election.[103]

On October 15, 2025, the Norwegian government presented its proposal for the state budget and national budget for 2026.[104] The proposed budget continued to prioritize and fund research and development activities for seabed mineral extraction, expecting to award these contracts and commence these activities in

Spring 2026.[105] However, subsequent versions omit these priorities.[106] To date, Norway has halted any exploration or extraction activities related to DSM on its continental shelf until 2029.[107]

The Norwegian *Seabed Minerals Act* (SMA) establishes the legal framework for deep-sea mining on Norway's continental shelf. It specifies that all seabed minerals within the continental shelf are state-owned, and any exploration or exploitation requires government authorization.[108] The Act also establishes a licensing process, requiring applicants to meet specific criteria before they can begin exploration or exploitation, and it requires applicant companies to submit environmental impact assessments to identify and mitigate risks to Arctic ecosystems before any DSM exploitation starts.[109] Additionally, the *Seabed Minerals Act* mandates that licensees implement measures to ensure compliance with DSM regulations under the Act and under broader environmental and resource management laws.[110]

Notably, the area in and around Svalbard is governed by the legal regime set out in the *Svalbard Treaty*.[111] Signed in 1920, it grants Norway sovereignty over the Svalbard archipelago but imposes conditions for international cooperation and resource access.[112] The treaty provides equal rights to all signatories (currently 43 countries, including the five Arctic coastal states) to engage in economic activities, including mining, on the islands and their territorial seas.[113] Although all signatories would have access to deep-sea mining within the islands' territorial seas (subject to Norway's mining regulations), the areas beyond this are part of Norway's exclusive economic zone and under its exclusive jurisdiction.[114]

Norway submitted its extended continental shelf claims to the Commission on the Limits of the Continental Shelf in 2006 and received the CLCS's recommendations in 2009.[115] Norway's submission included three areas: the Loop Hole in the Barents Sea, the Western Nansen Basin in the Arctic Ocean, and the Banana Hole in the Greenland and Norwegian seas.[116] The CLCS recognized these areas as qualifying as part of Norway's continental shelf. However, the Loop Hole and the Western Nansen Basin are subject to overlapping claims with Russia and Denmark, respectively, and the CLCS has advised Norway to delineate the boundaries with their neighbours.[117] The CLCS accepted the Banana Hole as an extension of Norway's continental shelf pursuant to Article 76 of UNCLOS.[118]

If Norway resumes deep-sea mining on its continental shelf, several legal and international challenges will arise. For example, within its continental shelf and extended continental shelf, pollution in the water column could violate Norway's OSPAR Convention obligations if DSM activities affect fish stocks, migration patterns, or biodiversity.[119] Norway's future DSM decisions will depend on balancing economic ambitions with environmental responsibilities and international obligations.

Russia

Russia is a dominant player in Arctic geopolitics, controlling approximately half of the Arctic Ocean coastline.[120] The Kremlin, the executive branch of the Russian government, adopts a state-driven approach to resource development, prioritizing control and economic power.[121] Russia's strong Arctic military presence highlights its desire to control the Arctic Ocean and its mineral resources: such as using the Navy to collect scientific data for extended continental shelf submissions.[122] However, the ongoing occupation of Ukraine has strained international cooperation in the region, potentially complicating negotiations between other Arctic states and Russia over the delineation of overlapping continental shelf claims.[123]

Russia's domestic framework for mining is focused on state control of mineral resources. All mineral resources are owned by the state, with the Kremlin managing subsoil (i.e., subsurface) use through a combination of administrative regulations and civil law.[124] The Law of the Russian Federation "On Subsoil" (Subsoil Law) is the primary legislation governing the exploration and extraction of mineral resources in Russia, both on land and offshore. According to the Subsoil Law, any subsoils on the Russian seabed are automatically plots of federal significance, conferring specific state rights and responsibilities.[125] Third-party rights to explore and extract minerals on the continental shelf are granted through federally issued licences.[126] Russia's mining laws, however, have been criticized for their incomplete codification, resulting in legal uncertainty, inconsistency, and fragmentation complicating regulation enforcement.[127]

The Kremlin's stance on deep-sea mining aligns with its broader objectives of maximizing resource control and asserting geopolitical dominance in the Arctic. While Russia has not yet operationalized DSM in the Arctic, it is sponsoring several DSM exploration projects in other regions through the International Seabed Authority.[128] Russia's actions in Ukraine have led to strained relationships with Western nations, and it is cultivating partnerships with non-Western countries, particularly China, to advance its Arctic resource development initiatives.[129] However, Russia's emphasis on resource independence means a critical minerals alliance with China is unlikely, as it fears becoming too dependent on Chinese critical minerals.[130]

Russia was the first Arctic coastal state to submit an extended continental shelf claim to the Commission on the Limits of the Continental Shelf in 2001.[131] In their response, the CLCS recommended delineating the outer limits of the Barents Sea with Norway and the Bering Sea with the United States, and requested additional data for the Central Arctic Ocean claim.[132] Russia revised its claim in 2015, providing supplementary addenda in 2021, expanding it to cover approximately 1.9 million square kilometres—roughly 70% of the Arctic Ocean

seabed.[133] Russia claimed key geological features like the Lomonosov Ridge, Mendeleev Ridge, Gakkel Ridge, and Alpha Ridge. However, the classification of these features as submarine elevations or submarine ridges remains contentious, creating uncertainty about the viability of any state's claim to them.[134]

In 2023, the CLCS accepted these extended continental shelf claims for part of the southeast Eurasia Basin in the Central Arctic Ocean, including a significant portion of Gakkel Ridge.[135] The CLCS also accepted Podvodnikov Basin as part of Russia's continental shelf.[136]

Russia's extensive extended continental shelf submissions have faced significant opposition from Canada and Denmark, largely because of overlapping claims. The determination of final boundaries cannot proceed until Denmark's and Canada's submissions are approved and diplomatic negotiations addressing overlapping claims have been concluded. These unresolved claims add to the geopolitical complexity of Arctic governance and resource management.

Russia has yet to formally engage in deep-sea mining activities but is positioning itself to capitalize on its extended continental shelf claims. As tensions with Western nations persist, Russia is likely to leverage partnerships with non-Western allies to advance potential DSM ambitions in the Arctic. However, ongoing disputes over extended continental shelf claims present challenges for Russia's future deep-sea mining.

The United States

The United States faces unique legal and geopolitical challenges as the only Arctic coastal state not to have ratified UNCLOS. The United States has signed the Agreement relating to the Implementation of Part XI of UNCLOS (1994 Agreement), which specifically pertains to the area beyond national jurisdiction.[137] While the U.S. has applied the 1994 Agreement, it has not ratified either instrument, and refuses to recognize the 1994 Agreement as binding customary international law.[138] Due to its non-ratification, the United States may only participate in discussions surrounding deep-sea mining as an observer rather than a full member of the International Seabed Authority.[139]

Domestically, the *Deep Seabed Hard Mineral Resources Act* (DSHMRA) of 1980 governs American involvement in deep-sea mining outside its national jurisdiction.[140] This Act predates UNCLOS, and grants the United States authority to conduct deep-sea mining in the Area.[141] The U.S. has issued four DSM exploration licences under this Act (although none since UNCLOS came into force in 1984).[142] None of these licences pertain to the Arctic Ocean.[143] In April 2025, the U.S. President signed Executive Order 14285 directing the National Oceanic and Atmospheric Administration (NOAA), in consultation with the secretaries of state and the interior, to expedite the process for reviewing and issuing licences and permits under DSHMRA.[144] TMC, The Metals Company, has already applied for a commercial recovery permit under NOAA's new consolidated application and review process.[145] Whether the United States will engage DSHMRA to grant this exploitation permit in the Area, sidestepping UNCLOS and the International Seabed Authority, remains uncertain.

On the U.S.'s continental and extended continental shelves, the *Outer Continental Shelf Lands Act* governs DSM, granting the federal government authority to manage minerals and grant leases for their exploration and exploitation.[146] Presently, American activities in the Arctic remain limited to scientific research and exploration on Alaska's continental shelf. Agencies like NOAA and the United States Geological Survey have assessed the region's resource potential, but no significant steps toward DSM exploitation have been taken.[147]

Additionally, Alaska is home to many Indigenous communities whose Traditional Territories may overlap with potential deep-sea mining sites. Consultation is required with these communities under the 1969 *National Environmental Policy Act* (NEPA).[148] This Act established the Council on Environmental Quality, which oversees and implements consultation requirements,[149] and requires the governing agency to invite "likely affected" Indigenous communities to participate before and during project assessment.[150] For deep-sea mining in the Arctic, NEPA's framework underscores the need for federal agencies to engage meaningfully with Indigenous rights holders, adding another layer of complexity to project approvals in the Arctic region.

Exploration activities have less environmental impact than exploitation and therefore enjoy more lenient NEPA obligations. To date, no DSM exploration activities appear to have undergone comprehensive NEPA reviews or Indigenous consultations. This is likely because Arctic deep seabed exploration is still in its early stages and mainly conducted by federal agencies.[151] However, if exploration licences are offered to private proponents, they will likely need to undergo the full spectrum of environmental and consultation procedures.[152]

In 2023, the United States announced its extended continental shelf claim but has not yet filed it with the CLCS.[153] To assert its claim, the U.S. must either ratify UNCLOS or attempt to submit the claim as a non-party, citing customary international law.[154] Since the CLCS must consider submissions by coastal states, even those not party to UNCLOS, the U.S. non-ratification is unlikely to pose a significant barrier—provided they ever submit their claim.[155] The greater challenge is geopolitical: other states are likely to reject the claim, especially if the United States refuses to substantiate it through the proper regulatory body.[156]

Despite its domestic and international legal hurdles, the United States remains active in Arctic affairs, reflecting its strategic interests in the region. While it has not pursued deep-sea mining in the Arctic, the U.S. has strengthened its presence through scientific research and military investments aimed at countering Russian and, increasingly, Chinese activities.[157] The U.S. has shifted focus to building agreements for data and technology-sharing among its "Arctic Allies."[158] Internationally, the United States actively participates in the Arctic Council, but its non-ratification of UNCLOS limits its influence on the future of deep-sea mining, especially since the International Seabed Authority holds primary authority in this field.

Domestically, fragmented domestic regulations, strict NEPA consultation requirements, and the infancy of Arctic exploration constrains progress. Balancing resource development with legal and environmental obligations, alongside geopolitical tensions, makes large-scale Arctic DSM projects in the territorial waters of the United States improbable in the near future. However, Executive Order 14285 signals a marked policy shift toward accelerating offshore critical mineral development in areas beyond national jurisdiction.

Although no Arctic exploitation submissions have been made to date, this executive direction raises concerns about potential unilateral reliance on domestic legislation like DSHMRA, the *Deep Seabed Hard Mineral Resources Act*, rather than proceeding through international cooperation. The International Seabed Authority has expressed concern regarding actions that could undermine the multilateral seabed regime established under UNCLOS.[159] Should the United States commence DSM exploitation in the Arctic's area beyond national jurisdiction, fellow Arctic states face two significant issues. First, the state's non-ratification of UNCLOS complicates treaty-based enforcement mechanisms, leaving the international community with limited avenues besides diplomatic or legal contestation. The second issue is more unique to the Arctic Ocean: deep-sea mining in the Area would require unilateral delineation of an extended continental shelf and the authorization of seabed activities in areas beyond national jurisdiction that are overlapping with competing Arctic claims.

The trajectory of United States deep-sea mining in the Arctic will turn not only on domestic political will, but on the extent to which international legal and diplomatic voices exert any influence.

Non-Arctic States

In addition to the Arctic coastal states, the interest in deep-sea mining in the Arctic is further complicated by the involvement of several non-Arctic states, some eager to capitalize on the region's resources and others seeking to halt or slow its progress.

Several non-Arctic states, notably China, have expressed interest in Arctic deep-sea mining. China has declared itself a "near-Arctic state" and is investing in infrastructure and scientific research under its Polar Silk Road initiative.[160] Beyond its Arctic scientific research efforts, China is involved in several onshore mining projects in Greenland and Canada and has partnered with Russia to develop critical Arctic infrastructure, including ports and shipping routes.[161] These investments in, and partnerships with, Arctic states highlight China's strategic approach to securing a foothold in Arctic resource development.

Similarly, South Korea, Japan, and Singapore have also shown interest in Arctic DSM, driven by their dependence on imported resources.[162] These countries have invested in Arctic research and infrastructure, seeking partnerships to navigate the region's challenging regulatory landscape.[163] The growing interest from non-Arctic states has intensified geopolitical competition, complicating cooperation. While some experts argue that Arctic nations should embrace foreign partnerships to maximize economic opportunities, others warn that such alliances could undermine their geopolitical advantages and sovereignty.[164]

On the other hand, significant opposition to DSM in the Arctic has emerged from states and international organizations. The European Union voiced its concern by openly opposing Norway's Arctic DSM propositions.[165] Forty countries have signed the position statement calling for a moratorium on DSM, citing the potential for irreversible environmental damage and the disruption of fragile ecosystems.[166] Prominent international organizations like the Clean Arctic Alliance have also expressed their concerns.[167] This Alliance argues the risks of DSM are often amplified in the Arctic context, where the impacts of climate change are already pronounced, and the risks of mining operations are heightened due to the region's remoteness and extreme weather conditions.[168]

Part IV. The Relationship between Non-Arctic and Arctic States—Benefit-Sharing and Legal Obligations

Arctic nations' exclusive access to seabed resources within their jurisdiction may challenge the equitable benefit-sharing ethos laid out in UNCLOS.[169] However, if non-Arctic states were to engage in deep-sea mining within the Arctic, it could disproportionately impact Arctic coastal nations, many of whom are opposed to DSM that could lead to ecosystem degradation, including the collapse of fish stocks.[170] This directly threatens Indigenous communities who rely on subsistence fishing and hunting. Pollution from DSM operations, such as sediment plumes and chemical discharges, is likely to reach the coasts of Arctic states first, exacerbating the local environmental impact.[171]

Moreover, Arctic coastal states face complex legal obligations in the event of DSM-related emergencies. For example, vessels conducting DSM activities may encounter operational challenges, such as equipment failures or ice-related incidents. Under UNCLOS, there may be some duty of Arctic states to assist non-Arctic states' vessels experiencing issues in their waters, requiring emergency assistance or remediation efforts, especially if the Arctic coastal state is the only state with the capabilities to render assistance.[172] However, these legal obligations are blurry, especially since assistance is particularly challenging in the Arctic's harsh conditions. Severe cold, storms, and remote locations can impede timely response, safe navigation, and effective rescue or remediation efforts. How far do legal obligations extend when feasibility is constrained by physical realities? These considerations highlight the need for internationally agreed-upon DSM regulations.

The CAOFA (*Central Arctic Ocean Fisheries Agreement)*, serves as a compelling example of how Arctic and non-Arctic states can collaborate to enact meaningful and precautionary legislation.[173] Recognizing the importance of broader international cooperation, the agreement was later expanded in 2018 to include non-Arctic stakeholders: China, Japan, South Korea, Iceland, and the European Union.[174] This agreement is notable because, despite the lack of current commercial fishing in these waters, it reflects a proactive and cooperative approach to resource management and environmental protection.

Deep-sea mining, like fishing, has implications that extend beyond Arctic borders. A similar framework could be applied to DSM regulation, opening collaboration with non-Arctic states to proactively regulate DSM in the Arctic. Ensuring compliance with environmental regulations and managing the geopolitical tensions between Arctic and non-Arctic stakeholders would require Arctic nations to coordinate closely, leveraging their coast guards and regulatory agencies to monitor and enforce DSM activities. Similar to the fishing moratorium, responsibility of ensuring compliance would likely fall on Arctic nations, which could be a prohibitive factor.

Part V. Conclusion

Newfound access to the Arctic is reshaping international relations, national sovereignty, Indigenous recognition, and environmental policies, creating a tangle of political, legal, and ethical challenges. Overlapping territorial claims, divided acceptance of international law such as UNCLOS, and varying domestic priorities leave the Arctic's legal seascape as contested as its geographic one. Coastal nations face the difficult task of balancing international obligations with national interests, including environmental protection, Indigenous consultation, and resource sovereignty.

While some states are advancing scientific research and policy frameworks, others advocate for moratoriums on DSM activities. Coupled with the increasing interest and involvement of non-Arctic states, the region's growing importance in global geopolitics is evident. Balancing resource development with environmental protection and geopolitical stability requires innovative international collaboration and robust regulatory frameworks to ensure the Arctic remains a shared space: not a battleground for competing interests.

As climate change transforms the Arctic, the Arctic coastal states will be key to shaping the governance of deep-sea mining within the region. While they stand to benefit from resource extraction, these states also bear the responsibility for DSM's environmental and social impacts. The Arctic remains a region of both cooperation and contention, where the rules for the future are still being written.

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Research Article

Multi-Level Governance for Renewable Energy Development in Nunavut: The Role of Community Consultation and Inuit Knowledge

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Abstract: This study pertains to the governance of renewable energy development in Nunavut. Despite the strong environmental and security risks posed by diesel use and dependency, the development of renewable energy in the territory is slow. As domestic, regional, and international actors are moving toward decarbonizing energy infrastructure, the energy transition of Nunavut is facing structural obstacles ranging from the costs associated with modernizing and decarbonizing the energy grid, to human capacity constraints. In what ways are community consultation practices and Inuit Knowledge embedded in renewable energy decision making in Nunavut, and how effective are they under Nunavut, Canadian, and international frameworks? As global attention is veering towards the Arctic, with strong emphasis on mining potential, the global energy transition becomes an opportunity for Inuit rights holders to develop local economies and livelihood opportunities, as well as invest in their own energy security needs. Since the signing of the Nunavut Lands and Resources Devolution Agreement in 2024, the cascading security threats of diesel dependency have become intertwined with needs to develop industries supporting the territory's energy transition. As such, through a qualitative content analysis of grey literature and seventeen interviews with key stakeholders and rights holders in Nunavut, this study offers insight into the governance of renewable energy infrastructure development in Nunavut.

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