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Competition for Seabed Resources

Washington Challenges International Deep-sea Mining Regime

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As the search for reliable sources of critical raw materials turns to the ocean floor, international conflicts could result. Although very little is known about the possible impacts of deep-sea mining, Washington has launched an initiative that undermines the existing international regime for seabed minerals. Currently, they are considered a global common good under the United Nations Convention on the Law of the Sea (UNCLOS). If the United States unilaterally launches commercial deep-sea mining, it would undermine a touchstone of international law and shake the foundations of ocean diplomacy and international maritime affairs. Germany, together with 36 other countries, spoke out against this at the United Nations Ocean Conference (UNOC-3) in June 2025, reaffirming its support for a "precautionary pause" on the introduction of this high-risk technology. In view of current global political turbulence, that line should be maintained.

The world has more than enough terrestrial mineral resources. But their availability is threatened by China's control of rare earths and its monopoly on processed rare earth metals. The latter will be needed in rapidly increasing quantities for many purposes, including building motors for electric cars and generators for wind turbines. This has generated increasing interest in seabed deposits of important minerals such as rare earths, nickel, copper, cobalt and manganese. They are increasingly drawing the attention of a narrative of scarcity, even though major consumers such as the European Union are already working to open up alternative sources. Growth in projected demand has generated strategic pressure to consider maritime deposits. This could result in conflicts over access and a lowering of environmental standards.

However, it remains largely unclear whether deep-sea mining can really be competitive with terrestrial mining; this will depend largely on price trends and smelting costs. These vary greatly depending on the specific ore: manganese nodules, polymetallic sulphides (in the central Indian Ocean), cobalt-rich crusts (mainly in the western Pacific off the coast of Japan).

Industrial policy currently focuses on the manganese nodule belt in the equatorial North Pacific between Hawaii and Mexico. Here, the concentration and distribution of seabed nodules would potentially make deep-sea mining economically viable. The potato-sized manganese nodules (also

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known as polymetallic nodules), contain manganese, nickel, copper, cobalt and rare earth elements, all of which are needed for the energy transition. New mining techniques now allow nodules to be raised from depths of up to 4,800 metres. Small-scale collectors have already been used to suck up nodules and return the sediment. It is questionable whether the seabed will recover after the sediment has been stirred up, and whether individual species will recover. Organisms that live on the nodules will obviously not survive the loss of their habitat.

The current debate is multi-faceted. Supporters are concerned with issues range from prospecting deposits to collecting environmental data, assessing viability and quantifying the resources required for future exploitation. The other side argues for a ban — or at least a temporary suspension — to preserve the ocean ecosystem and encourage further research.

Internationalisation of seabed and national economic interests

Deep-sea mining opens up a new area of strategic competition between the major powers. Growing demand for resources increases the pressure to exploit marine deposits. In view of the growing interest in commercial exploitation, there is a risk that seabed minerals will become militarised or be extracted unsustainably. This brings the international interest in ocean governance and protection into conflict with the economic interests of individual nations.

The framework for exploitation of seabed resources is the United Nations Convention on the Law of the Sea (UNCLOS) of 1982, which entered into force in 1994. It has been ratified by 170 states, and is legally binding for signatories of the international community. This has been associated with an internationalisation of the seabed and its subsoil, which is classed as the "common heritage of mankind" (Art. 136 UNCLOS). This means that property and access rights, as well as licensing procedures and environmental standards, are subject to the decisions of the international community. The United States has refused to sign UNCLOS because it fears that this could infringe on its sovereign rights.

The regulatory framework for the seabed, defined by UNCLOS as "the area", is governed by the International Seabed Authority (ISA), based in Kingston, Jamaica. All signatories of UNCLOS are ipso facto members of the ISA, which has jurisdiction over approximately 55 per cent of the world's ocean seabed, while the remaining 45 per cent falls under the jurisdiction of the respective coastal states (as exclusive economic zone [EEZ] or continental shelf). Although coastal states are free to grant mining licences in their national waters, these are also subject to the environmental provisions as members of UNCLOS.

Regulated exploitation of seabed resources beyond the EEZs will require sectoral mining codes for the different types of material. This is being done by the ISA in a multi-stakeholder process encompassing the interests of states, companies, science and civil society. The resulting regulations, which must cover licensing, environmental protection, liability and financing, are correspondingly complex. Drafting of a regulatory framework was originally scheduled to be completed by 2020, but the multiplicity tasks and interests has prevented consensus being reached. A breakthrough is now expected in 2025.

Exploration of manganese nodule deposits is still under technical development. The mining equipment must be largely maintenance-free and will require major investment and incur considerable operating expenses, while the costs of processing technologies are still difficult to estimate. Another problem for the economic exploitation is the sometimes complex seabed topography, which still places significant restrictions on the use of mining technologies. Finally, comparative cost comparisons with terrestrial mining and recycling have not yet been completed.

Trump's executive order

On 24 April 2025, US President Donald Trump issued an executive order "Unleashing America's Offshore Critical Minerals and Resources". It included a review of existing licence conditions and the prospect of new licences for seabed exploration and commercial extraction, even in areas "outside national jurisdiction" (Sec. 3, a (1)). Under a "one-stop shop" approach, Washington says it wants to be a global leader in the responsible exploration of seabed mineral resources, including the development of technologies and practices. It also offers to partner with countries that want to develop their own seabed resources.

The presidential decree increases the risk that the United States could ignore the ISA's rules. Not being a signatory to UNCLOS, it might not feel bound by treaty law and could operate unilaterally. This would mean that deep-sea mining could be pursued commercially outside the rules of (customary) international law. The Brazilian Secretary-General of the ISA, Leticia Reis de Carvalho, therefore called on to the US government "to channel its efforts toward developing a leading role in deep-sea science, technology, and seabed mineral resource activities through the institutional and legal frameworks established by the international community under the United Nations Convention on the Law of the Sea, a treaty that enjoys broad global recognition and legitimacy".

Just five days after Trump issued the executive order, The Metals Company USA — the US subsidiary of a Canadian company with strong interests in seabed mining — applied for permission for commercial extraction of deep-seabed minerals under the US Deep Seabed Hard Mineral Resources Act (DSHMRA). This suggests that the United States could bypass the ISA, possibly even granting licences for areas beyond its national jurisdiction that overlap with those that are to be allocated by the ISA. The resulting seabed delimitation conflicts are likely to trigger international disputes over raw material governance and ownership of seabed resources. Competing claims could lead to geopolitical friction and disputes, turning international waters into an arena of global political rivalry.

The Metals Company's application is initially limited to commercial extraction in US waters under the DSHMRA. However, the company may intend to expand this later by applying to the National Oceanic and Atmospheric Administration (NOAA, an agency of the US Department of Commerce) for licences to explore and commercially extract seabed resources outside US waters. The company is primarily interested in manganese nodules, whose exploitation is currently only profitable outside US waters, in the Clarion-Clipperton Zone (see below).

The Trump administration's unilateral approach could end up propelling an international race for resources, as Washington's rush raises fears that other countries could follow suit.

The competitor: China

Chinese companies already dominate the mining and processing of critical minerals on land. China already accounts for 60 per cent of global production and 85 per cent of processing capacity. Now it has also set its sights on deep-sea lithium and cobalt. Large state investments have catapulted China to the forefront of this new sector, closely followed by Russia and South Korea. It leads both technically and in scale of exploration, with five of the seventeen exploration contracts approved by the ISA to date.

Unlike the United States, China has ratified UNCLOS and is taking advantage of its opportunity to shape the regulations currently under negotiation. China's clearly articulated interest in exploiting maritime raw materials has brought it into conflict with the thirty-seven states that support a moratorium on commercial deep-sea mining until the deep-sea ecosystem is better understood.

Beijing's political pressure to adopt rules for commercial exploitation as soon as

possible seems to be driven by the maxim "first come, first served". China clearly wants to showcase its technological capabilities, gain economic advantages and underline its status as a maritime power. Military interests linked to China's drive for maritime expansion are also likely to play a role. For example, dual-use technologies used in autonomous underwater vehicles to measure ocean currents can also serve to conduct kinetic strikes.

China is taking a strategic approach and forming alliances with island states — most recently with the Cook Islands — to explore and possibly extract their deep-sea mineral deposits. The Pacific nation of Kiribati is also reportedly considering a deep-sea mining partnership with China. This could give China access to a huge area in the Pacific Ocean, after Kiribati and The Metals Company of Canada "mutually agreed" to terminate their cooperation at the end of 2024.

The way China's involvement in deep-sea mining blurs the lines between scientific research, commercial exploitation and geopolitical advantage is a cause for concern for many countries considering cooperating with Beijing. There is also an internal contradiction in China's positions: on the one hand, it is interested in massive exploitation; on the other, it also joins the majority of developing countries in supporting environmental regulations. Beijing's argument that it is seeking to update outdated regulatory systems shaped by the industrialised countries is not widely shared by developing countries. Instead, China is working to create a strategic consensus among countries that support the exploitation of maritime raw materials. To this end, it is promoting scientific and technological exchange through the establishment of transnational cooperation platforms, for example with Russia, South Korea, Japan and India.

Trials in the Clarion-Clipperton Zone

The Clarion-Clipperton Zone (CCZ) is an abyssal plain in the central Pacific Ocean, between Hawaii and Mexico. It covers an area of 4.5 million square kilometres — as wide as the continental United States and half the size of Canada — and reaches depths of 4,000 to 5,500 metres. The zone is characterised by seamounts and rich deposits of nodules. In some places up to 60 per cent of the seabed is said to be covered with manganese nodules, which explains the great interest in exploiting the area economically and makes it ideal for trials. To date the ISA has only granted exploration licences, but some of the licence-holding states would like to convert them into exploitation licences. However, it has not yet been possible to develop a mining code that strikes the difficult balance between economic interests and environmental protection.

The ISA is responsible for regulating and managing the CCZ. To date, it has awarded seventeen contracts for exploration of polymetallic nodules in the zone. Each is valid for fifteen years, and together they permit prospecting in an area of 75,000 square kilometres. In accordance with the principle of the "common heritage of mankind", states may not claim the area or parts thereof as their own territory. When a the licence expires, the area reverts to the ISA. The licence-holders — fourteen state agencies and private companies (consortia) — are permitted to explore mining opportunities within their area and assess economic viability and environmental compatibility. They are contractually obliged to collect environmental data and to ensure that the testing of mining equipment does not cause serious damage the marine environment.

The licences were allocated on the basis of the environmental management plan for the CCZ approved by the ISA in July 2012. This takes into account the interests of mining exploration while recognising the designation of additional areas of special environmental interest.

Germany has also acquired an exploration licence, through the Federal Institute for Geosciences and Natural Resources (BGR) on behalf of the Federal Ministry of Economic Affairs. It permits exploration in an area of 75,000 square kilometres in the so-called manganese nodule belt. The BGR planned to test an AI-controlled manganese nodule collector from the US company Impossible Metals in early 2026, although this has now been postponed.

Trump's presidential decree targets the CCZ, seeking to satisfy American raw material interests through unilateral licensing, bypassing the ISA. This raises the prospect of competition between the major powers manifesting itself in the CCZ, not least in the form of a "tech cold war" in which control of technological value chains becomes a "weapon". The risk of confrontation increases where technological supremacy is intertwined with economic and military dominance. Binding regulations for dependable international cooperation are therefore needed to avoid conflicts on the ocean floor.

Is multilateralism failing in deep-sea mining?

The ISA is the authoritative body for regulating deep-sea mining beyond the EEZ, in other words, in all waters outside national jurisdiction. This means that every state — including the United States — is already free to use its own continental shelf as it pleases.

The triple role of the ISA complicates the search for consensus and could prove to be an obstacle to multilateral agreements on the future of deep-sea mining. Firstly, is the regulatory authority for deep-sea mining and environmental regulations; secondly, it is responsible for issuing the relevant licences and monitoring their implementation; and thirdly, it administers mining royalties and compensation payments to developing countries disadvantaged by deep-sea mining. The ISA's Legal and Technical Commission drafted an exploitation regime and submitted it to the Council in 2019, but since then, discussions have been bogged down by fundamental differences of opinion.

The search for robust regulations to enable deep-sea mining has so far been blocked by a group of thirty-seven countries led by France and Germany, which are calling for a moratorium until greater clarity about the risks has been obtained. Another group of countries (Belgium, China, India, Singapore, South Africa, the United Kingdom and various Pacific states) argues that, in view of the emerging race to exploit seabed resources, their extraction should be regulated as soon as possible.

The German government has always emphasised that it does not intend to submit any exploitation applications until the relevant issues have been clarified. Chancellor Friedrich Merz's coalition has also committed itself to a precautionary pause. But German industry is calling on the government to participate actively in the development of mining codes for seabed minerals.

Since maritime law grants preferential rights to developing countries (UNCLOS Art. 170 and Annex 4), the asymmetry of access to and benefits from deep-sea mining make it difficult to reach quick compromises. This applies in particular to the mining code for manganese nodules, which, as mentioned above, has not yet been agreed. Last but not least, there is disagreement on how to distribute mining royalties, which could be an attractive source of income for many countries. It has also proved difficult to agree rules for the equitable sharing of economic benefits from deep-sea mining outside national jurisdictions. In addition, according to a recent study by the Rand Corporation, it is foreseeable that deep-sea mining will lead to a decline in metal prices, which would result in lower revenues from terrestrial mining for developing countries. That decline is likely to be larger than any revenues from seabed mining licencing and associated economic development programmes.

The first part of the 30th ISA Annual Meeting, from 17 to 28 March 2025, failed

to reach a full consensus. In view of this, the Pacific island state of Nauru proposed a "procedure for the consideration of applications for exploitation plans in the absence of adopted exploitation regulations". The proponent of the exploitation plans, Nauru Ocean Resources Inc. (NORI), intends to submit an application in 2025 for permission to extract 1.5 million tonnes of nodules per year. NORI is a wholly owned subsidiary of The Metals Company, which also supports Washington's unilateral move to permit nodule mining in international waters. The Metals Company is thus involved in initiatives both within and outside the UNCLOS framework. This placed the ISA under pressure to reach a decision on the Mining Code during the second part of the consultations from 7 to 18 July 2025. However, recognising mounting pressure from both within and outside the ISA, a decision was not reached and the organisation's Council will continue working on the draft regulations for exploitation of deep-sea mineral resources. There is no sign of a decision to initiate a procedure for reviewing an application in the absence of operating regulations (see Section 1(15)(b) of the Annex to the Agreement on the Implementation of Part XI of the UNCLOS).

Establishing new value chains

The development of deep-sea mining will require a new value chain — from extraction to processed minerals. Refining processes are likely to change the most, as they will need to be adapted to deep-sea materials, specifically requiring a different supply chain, new smelting technologies and disposal methods for overburden. In June 2022, the United States, together with its G7 partners, launched the Global Infrastructure and Investment Partnership to build clean energy supply chains. They also signed the Partnership for Mineral Security to counter Chinese dominance in this area. On 13 July 2023, the Biden administration announced $32 million to support projects focused on expanding the mining and processing of critical minerals and rare earths. However, this did not include deep-sea mining. The Trump administration has not pursued cooperation on raw materials with its G7 partners (or in its foreign policy in general).

For many countries, especially Pacific island nations, the priority is to develop a sustainable approach to deep-sea mining, in order to profit from the raw materials found on the seabed. This could prove short-sighted, if they fail to take the entire supply chain into account, including the stage of industrial smelting. Exporting manganese nodules to China or the United States for processing and refining is likely to significantly reduce revenues and entail additional risks, especially as the small states mentioned above could be crushed between the major powers in the "tech cold war".

The potential impact of increasing commercial activity in the deep sea is still largely unclear — both in terms of the potential economic benefits and in terms of priorities (economic or military). Due to the great depths involved, the vast extent of the spaces and the limited knowledge available to date, it is very difficult to operate in, monitor and control the deep sea. This applies equally to the ISA and to individual states and groups of states. So far, the EU itself has not been a player at the international level in this area; the member states pursue their national objectives independently.

The ultimate aim should be to agree environmental rules for the entire supply chain, not just for extraction (which is the initial priority). The environmental impact of smelting and overburden disposal in terrestrial mining is well known; impact assessments for deep-sea mining are still awaited.

Challenges for national and international ocean diplomacy

As ISA Secretary-General Leticia Reis de Carvalho outlined in her inaugural speech, ocean diplomacy faces major challenges —

especially as disputes over deep-sea raw materials become more heated due to developments in geopolitics and industrial policy. The ISA wants to (and must) bring together the interests of a wide range of actors along the supply chain through its "multi-stakeholder" approach. These include governments, which formulate their own strategies to secure economic growth and seek to influence the ISA accordingly; environmental organisations and scientists committed to protecting valuable species and ecosystems; communities whose livelihoods depend on the oceans or on the exploitation of terrestrial mineral resources; companies developing plans and technologies for responsible deep-sea mineral extraction; terrestrial mining companies; and economic and ecological researchers.

The ISA intended to finalise its mining code for manganese nodules at its 30th meeting in July 2025, but deliberations will continue in its 31st annual meeting in 2026. It is under pressure — not least due to the actions of the Trump administration — to fulfil its legal and political responsibilities. Apart from the need for institutional reforms and a more strategic approach, the ISA and its member states must adopt regulations and rules that provide answers to key questions. In so doing, they must consider the different positions that have emerged, in particular the gap between the group of countries in favour of exploitation and those advocating a moratorium. This demands ocean diplomacy that takes account of the geopolitics, but that generates additional problems in reaching a consensus.

While some in the business world see critical raw materials as an instrument of (future) power, such positions ignore the fluid nature of international relations and technological development. They sideline options such as recycling and the circular economy, and especially the search for alternative materials and processes. In extremis, access to raw materials is equated with military power. It is also unclear how profitability, prices and demand for raw materials will develop.

Washington's initiative to secure critical minerals on the seabed, described by the NOAA as "the next gold rush", undermines the principle of the "common heritage of mankind". Yet that principle is widely recognised in the international community, and should continue to guide future German policy. France and Germany, together with their allies, should continue to pursue the goal of curbing geopolitical competition for control of seabed resources and thus averting lasting damage to the ocean ecosystem.

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