



**GAMBLING WITH THE DEEP SEA:
THOSE BETTING ON MINING
THE ARCTIC**

A deeper look at the Norwegian government and
companies' efforts to start deep sea mining in the Arctic

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1. EXECUTIVE SUMMARY

The Norwegian government has recently announced a decision to open up a vast area of its continental shelf in the Norwegian and Greenland Seas to deep sea mining, making Norway the first country in the Arctic region to give the go-ahead to this new, untested industry. The government has begun the process of offering licences to companies to extract minerals from the seafloor, at the risk of disturbing fragile ecosystems that host a rich biodiversity of marine life and about which much remains unknown, with new species and ecosystem functions still being discovered. Reportedly, six companies – Loke Marine Minerals AS, Adepth Minerals AS, Green Minerals AS, Aker BP ASA, Quantum Marine Minerals AS

and TGS – have already handed in their nominations for blocks to suggest the first areas for exploration and exploitation.¹

To mine these resources, specialised machinery will need to operate at depths of up to 4,000 metres, scraping the seabed and pumping the extracted material to the surface, while waste materials are returned to the ocean.^{2,3} One of the more vocal companies working to position themselves as a supplier of offshore machinery to the deep sea mining industry is the Norwegian company Seabed Solutions, which is closely linked to Adepth Minerals through their joint technology project⁴ and claims to provide the only seabed mining machine in the world capable of operating 4,000 m below the surface.⁵



These machines were developed by Soil Machine Dynamics Ltd (SMD) for Nautilus Minerals Inc. and their Solwara 1 project in Papua New Guinea. These are relevant for the Norwegian case, as the machine concept is discussed in DNV's technology report for deep sea minerals, prepared on demand for the Norwegian Petroleum Directorate in 2021.⁶ Nautilus's machine concept is also close to the concept proposed by Green Minerals in 2024, the Subsea Miner, also developed by SMD.^{7,8}
© Godfrey Jordan Abage, Alliance of Salwara Warriors, Papua New Guinea

The companies listed in this report must take responsibility for the harms associated with the proposed mining operations, and not engage in destructive and potentially illegal activities in the deep sea. This must entail putting all their deep sea mining plans on hold, and divesting from all deep sea mining projects.

Scientists, Indigenous peoples, businesses and environmental groups have raised significant concerns about deep sea mining, and about the legal and legislative process carried out by the Norwegian government. The full environmental impacts are as yet largely unknown, but likely to be severe and far-reaching. The mining process will disrupt ecosystems that have developed over thousands, if not millions, of years, and destroy vital habitats and unique species that play essential roles in the greater marine ecosystem.

But our knowledge of the deep ocean floor is still developing. Just how little we know about how deep sea ecosystems function was highlighted by the recent discovery of a previously unknown phenomenon, possible dark oxygen production in nodule fields in the deep sea without photosynthesis.⁹ No doubt, more unexpected and wonderful discoveries about the ocean floor will come to light in the years to come – highlighting an important reason why destructive deep sea mining activities should not be allowed to proceed.

Norway's approach to deep sea mining has been criticised for several reasons. Critics argue that the Norwegian government has not considered the full ecological implications. The Seabed Minerals Act, which regulates mining in the Norwegian continental shelf, is seen as insufficiently detailed, and the government's environmental impact assessment has been denounced for lack of depth, vast knowledge gaps about

the ecosystems that could be impacted and insufficient consideration of regional environmental conditions. For example, there are concerns that deep sea mining activities could disturb carbon storage and carbon cycling processes, and that Indigenous communities, such as the Sámi people, could be severely impacted in terms of their food security and cultural practices.¹⁰

Norway's decision to open its seabed to mining has faced opposition from other Nordic countries, the EU and international organisations. While the relevant intergovernmental body, the International Seabed Authority, is still debating whether to open international waters for mining amid growing political support for precaution,¹¹ Norway is pushing hard to accelerate the process both at home and abroad. Yet, faced with international opposition, a global movement of over 3 million people fighting to protect the deep sea against aggressive mining companies¹² and broad criticism from the scientific community, the industry today appears to lack both social acceptance and public licence to operate.¹³

Numerous scientific studies demonstrate that deep sea mining is unsustainable and poses an unacceptable risk to the marine environment.¹⁴ In addition, the legislative process carried out by the Norwegian government has not been transparent and has reportedly been deeply flawed in a number of areas.¹⁵ In its haste to push through the process to embark on deep sea mining activities, rather than taking a precautionary approach, the government appears to have brushed aside the widespread criticism and alarm raised by the move to make Norway one of the first countries in the world to allow deep sea mining.¹⁶ This represents a dangerous gamble with the health of our oceans.

Greenpeace International calls on the the Norwegian government to:

- 1. stop the first licensing round for deep sea mining,**
- 2. halt all funding for exploration activities and development of deep sea mining technologies, and instead**
- 3. support a moratorium on deep sea mining, as more than 30 governments have already done, and**
- 4. refocus its efforts on developing circular measures for resource use and a better understanding of the biodiversity of the deep sea to enable its protection.**

2. DEEP SEA MINING CONTEXT



The sea anemone (*Urticina crassicornis*) is a large, colourful species found in cold, northern waters. This photo was taken in the Arctic Ocean near Spitsbergen, Svalbard, Norway.
© Solvin Zankl / Greenpeace

2.1 WHAT IS DEEP SEA MINING?

Deep sea mining is the practice of removing metals and minerals from the ocean's seabed.¹⁷ Thousands of metres below the surface, over thousands or even millions of years, deposits of minerals like manganese, nickel, copper and cobalt have built up on the seafloor into fist-sized nodules and accumulated in the crusts formed on seamounts and seafloor massive sulphide (SMS) deposits around hydrothermal vent fields.¹⁸ A study released in July 2024 that was conducted in the Clarion-Clipperton Zone in the Pacific Ocean shows evidence that oxygen can be

produced in the absence of any light via an electrochemical process at the deep seafloor, where polymetallic nodules seem to function like small batteries.¹⁹ While the full implications of these findings are yet to be determined, they point to the opening of a new and huge field of scientific research - and show once again how little we know about the deep seafloor.²⁰

Polymetallic nodules are not found on the Norwegian continental shelf, but sulphides and manganese crusts with high concentrations of copper, zinc and cobalt and significant volumes of rare earth elements are present.²¹ Greenpeace International has shown in a recently published report that the waters of the Norwegian Sea contain rich biodiversity, with the hydrothermal vent fields along the Atlantic Mid-Ocean Ridge, where extremely cold water collides with superheated magma seeping through cracks in the seafloor, giving rise to unique habitats and

life forms that have adapted to the extreme conditions.²²

The proposed mining area covers 281,200 km²,²³ with depths ranging from 500 to 4,000 m.²⁴ To mine the metals, machines capable of operating thousands of metres below the surface would scrape or cut deposits from the seamount slopes and summits and the ocean floor. They would then pump the mined material up to surface support vehicles, through several kilometres of tubing, after which the ore would be transported to land while sand, seawater and other mineral waste would be pumped back into the water.^{25, 26}

Deep sea mining is a new industry. Although some tests have been conducted, no commercial mining has happened yet. However, the companies involved are pushing for short time frames for developing the industry in the Arctic, with ambitions to start pilot production as soon as 2028.²⁷



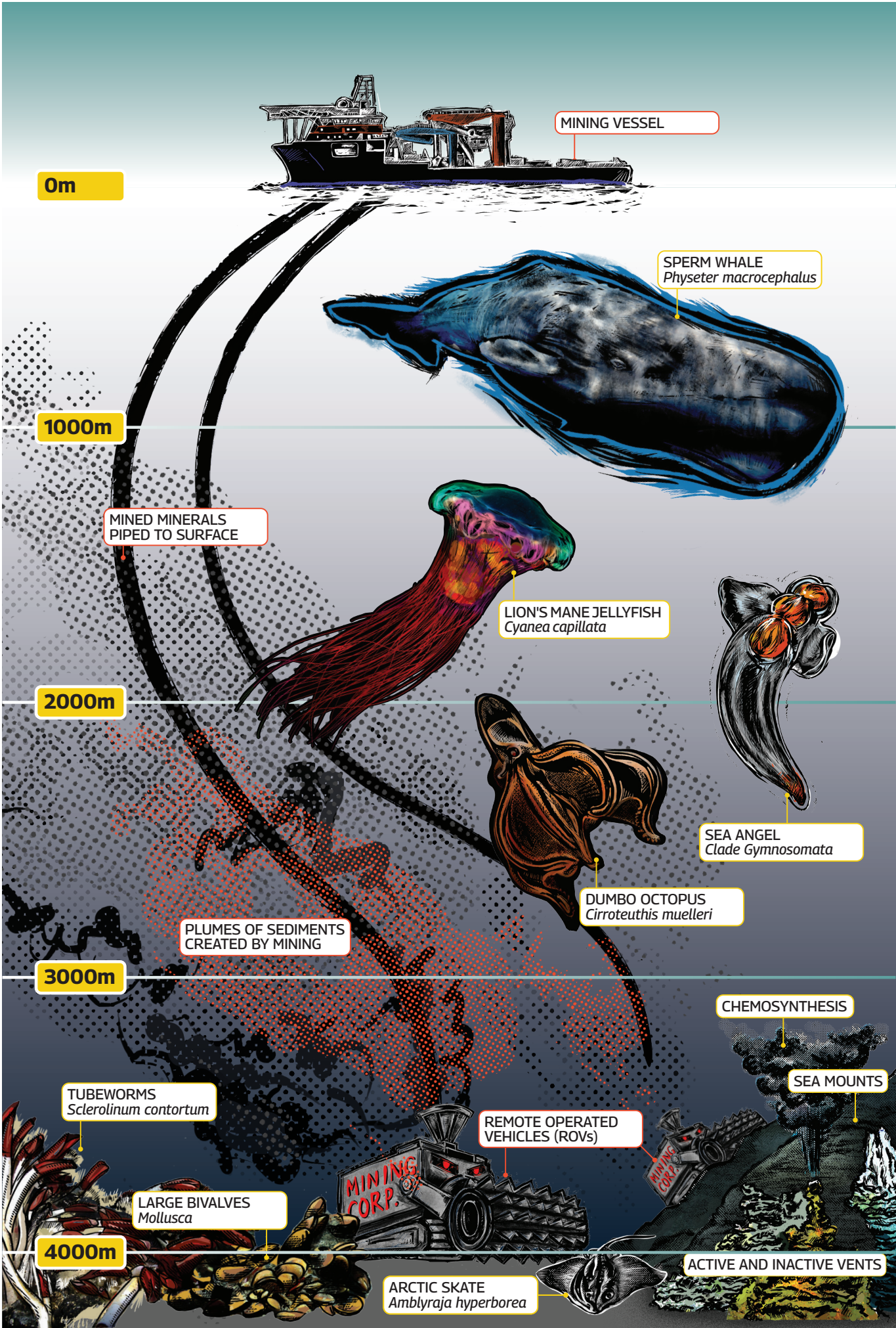
Manganese crusts from seamounts.
© Jan Steffen / GEOMAR



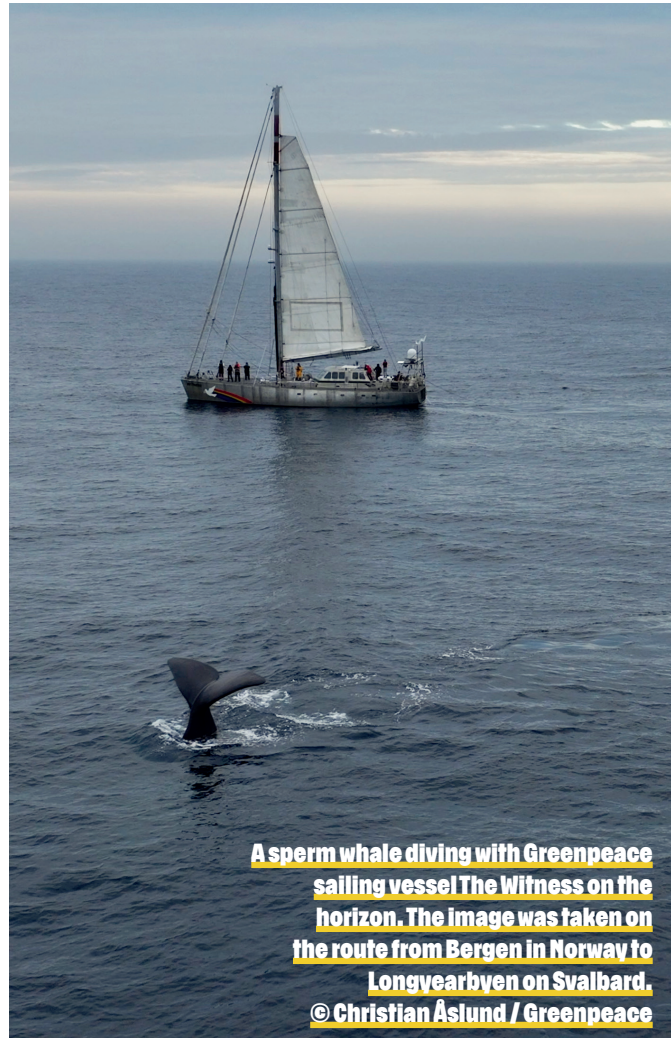
Seafloor massive sulphides (SMS) from hydrothermal vents. © Jan Steffen / GEOMAR



Manganese nodules.
© Jan Steffen / GEOMAR



2.2 CONCERNS ABOUT DEEP SEA MINING



A sperm whale diving with Greenpeace sailing vessel The Witness on the horizon. The image was taken on the route from Bergen in Norway to Longyearbyen on Svalbard. © Christian Åslund / Greenpeace

Like mining on land, deep sea mining is extremely destructive – but mining the ocean floor carries additional risks, for many reasons. The full environmental impacts of deep sea mining are hard to predict, but they are likely to be highly damaging, both within and beyond the areas being mined. Once the polymetallic deposits containing the sought-after minerals in cobalt crusts and SMS deposits are gone, neither they nor the ecosystems that thrive around them can be replaced. Research in the Pacific shows that the environmental impacts of deep sea mining could last anywhere from decades up to hundreds or thousands of years, and all ecosystem compartments will likely be affected.²⁸ Assessments of disturbances in the bioactive layer as a result of nodule mining indicate that impacts on the benthic ecosystem functions could persist on a millennial time scale.^{29,30,31}

In Arctic waters, there is much underwater volcanic activity along the spreading axis where new seabed is being formed at tectonic plate

boundaries. On average, one underwater volcanic eruption occurs in Norwegian deep sea areas every single year.³² It is this volcanic and associated hydrothermal activity that has resulted in the formation of the manganese crusts and sulphide deposits that are of interest to the deep sea mining industry on the Norwegian seabed.³³

Mining activities will destroy habitats and harm marine life, with the potential for far-reaching impacts well beyond the mining zone.^{34,35,36,37} The deep ocean is a vast reservoir of biodiversity, from glowing sharks to armoured snails, with new species – such as the big-finned jellyhead octopus, *Cirrotheuthis muelleri* – being discovered every year.³⁸

Deep-sea ecosystems are among the most pristine environments remaining on Earth, with unique species and complex ecological networks. Our oceans are the world's largest carbon sink. The full effects of mining, including removing benthic organisms and mobilising sediments in the formation of plumes, are poorly understood.

Seabed mining has the potential to cause widespread disturbance to carbon cycling and storage and to deep sea organisms.³⁹

The regions being targeted for mining, including the Mid-Atlantic Ridge and the Arctic Mid-Ocean Ridge, are known for their sulphide chimneys and sponge grounds, which are referred to as vulnerable, fragile or priority marine ecosystems and recommended for protection by actors such as the United Nations General Assembly (UNGA), the Conference of the Parties to the Convention on Biological Diversity (CBD) and the Oslo and Paris (OSPAR) Commission for the Convention for the Protection of the Marine Environment of the North-East Atlantic.⁴⁰ Many of the corals and sponges that live on the seamounts and slopes are unique to the Arctic, and the sponge grounds house a host of marine animals, including fish, octopuses and crustaceans.⁴¹

A Greenpeace International expedition in August 2024 also found cetacean biodiversity in areas



Sperm whale being hunted by an orca whale off the coast of Sri Lanka.
 © Paul Hilton / Greenpeace

targeted for deep sea mining. The Arctic expedition surveying whales and dolphins has identified deep-diving whales in several parts of the proposed mining area since the survey began at the end of July.^{42,43} The noise pollution from deep sea mining would travel far, and could be extremely disruptive to cetaceans that use sound as a primary means of underwater communication and sensing.⁴⁴

MiningWatch Canada, the Deep Sea Mining Campaign and Greenpeace International reported that mining tests carried out by The Metals Company and Allseas on nodules released wastewater containing debris and sediment directly into surface waters in the Pacific.⁴⁵ Sediment plumes from mining machines and from waste material released back into mid-water ecosystems risk harming ocean life far beyond the mine site.⁴⁶ Although this has been one of the major concerns related to deep sea mining, very limited research has been conducted on particle spread in the Norwegian mining area.⁴⁷

Peer-reviewed science shows that deep sea mining is almost certain to cause lasting damage to deep sea ecosystems.⁴⁸ Such damage might also threaten the ways of Indigenous people living in the Arctic. In June 2024, the Indigenous people of Scandinavia, the Sámi, expressed their concerns in a public statement, emphasising that 'The ocean is not just a resource but a foundation of life, culture, and sustenance. The potential environmental degradation caused by deep sea mining could severely impact our food security, disrupt traditional practices, and undermine our cultural heritage.'⁴⁹ The coastal Sámi population traditionally live off the land and rely heavily on small-scale fishing in the fjords and along the Arctic mainland coast.

According to the United Nations, our oceans provide more than three billion people with their livelihoods.⁵⁰ The connections between deep seabed habitats and broader ecosystem functions, such as nutrient cycling,

productivity, metal cycling, and carbon fixation, cycling and storage, are poorly understood. Recent research is revealing new insights, such as the finding that the contribution of hydrothermal vents to surface productivity is greater than expected. This adds to the body of knowledge that implies that damage to deep sea ecosystems by deep sea mining would likely have far-reaching consequences.⁵¹

Any attempt at starting deep sea mining will take place as oceans face more pressures than at any time in human history, threatened by industrial overfishing, plastic pollution and the climate crisis.^{52,53} Risking this delicate system during a climate emergency could have irreversible impacts on the planet.⁵⁴

3. NORWAY'S PLANS FOR DEEP SEA MINING IN THE ARCTIC

On 12 April 2024, Norway's Council of State approved the opening of an area of the Norwegian continental shelf in the Norwegian and Greenland Seas for seabed mining activities. The decision permits the granting of both exploration and exploitation licences.^{55, 56}

A proposal for licensing areas, consisting of 386 blocks covering 38% of the opened area, was sent for public consultation on 26 June 2024.⁵⁷ The areas proposed for licensing overlap with several SVOs (*Særlig verdifulle og sårbare områder*), a term used to define areas of particular importance for biological diversity and production that

'If it persists with these ambitions, Norway will go further than any other country in the world in allowing the mining industry access to the deep ocean.'

have been deemed particularly valuable and vulnerable by the Norwegian parliament.^{58, 59}

The Ministry of Energy has already started the first round of licensing, where it is expecting to issue

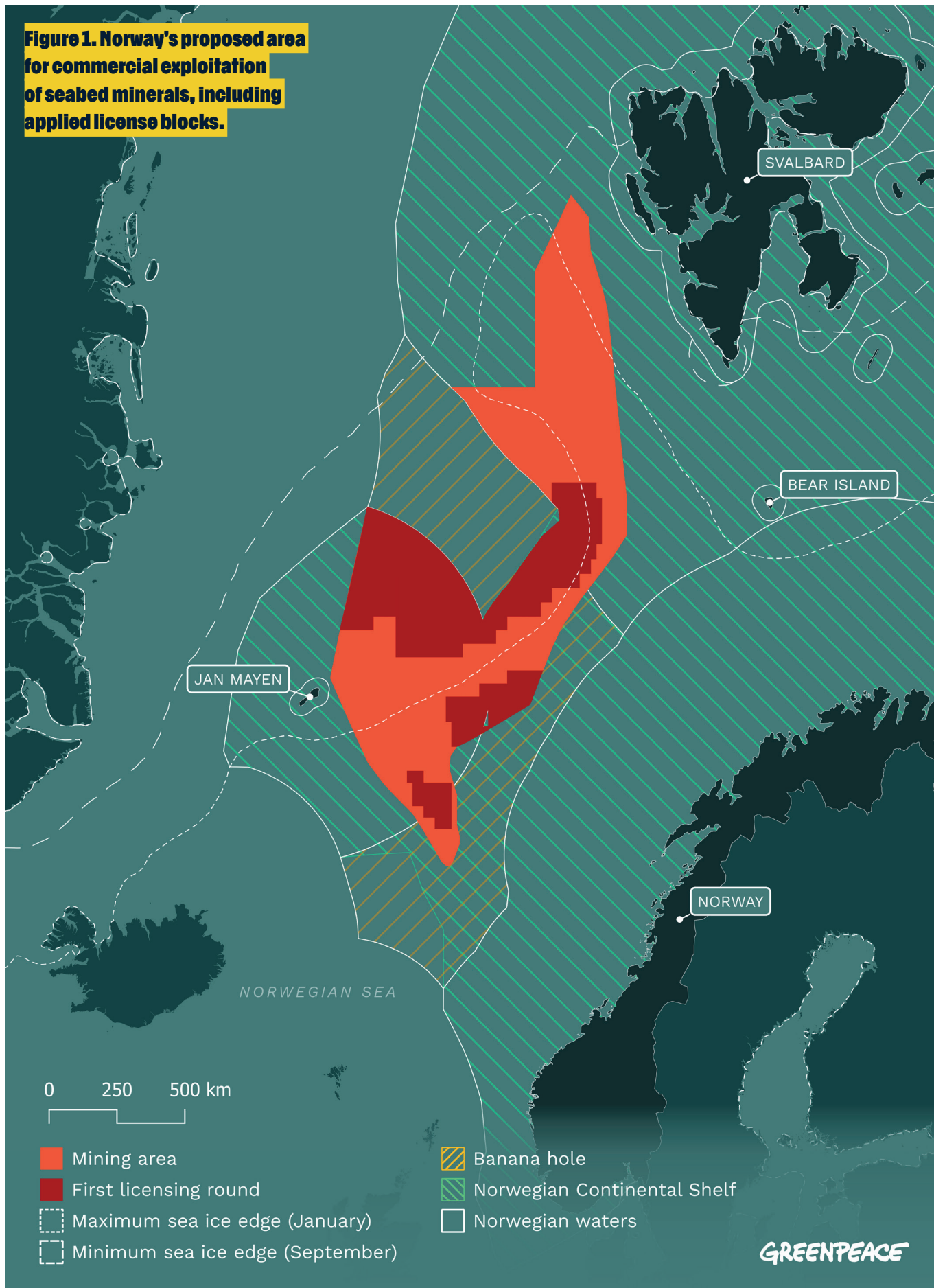
exploitation licences. The government is aiming to grant the first exploitation licences by mid-2025,⁶⁰ with the aim of exploration starting the same year and exploitation as soon as 2030.⁶¹ If it persists with these ambitions, Norway will go further than any other country in the world in allowing the mining industry access to the deep ocean.

This section presents an overview of the timeline behind the process, the Norwegian government's rationale for starting deep sea mining activities and the criticisms of its decision.



Protest message projected on the Norwegian parliament building in Oslo.
© Will Rose / Greenpeace

Figure 1. Norway's proposed area for commercial exploitation of seabed minerals, including applied license blocks.



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3.1 THE NORWEGIAN GOVERNMENT'S DEEP SEA MINING TIMELINE⁶²

10 May 2017 - The Ministry of Petroleum and Energy initiates a public consultation on a proposal for a new law on seabed mineral activities on the continental shelf.

22 June 2018 - The Solberg government presents a proposal for a new law on seabed mineral activities on the continental shelf (the Seabed Minerals Act).

01 July 2019 - The Seabed Minerals Act comes into force, after its adoption by the Norwegian parliament (Storting) on 22 March.⁶³

11 May 2020 - The Solberg government starts a process to open parts of the Norwegian continental shelf for seabed mineral activities.

12 January 2021 - The Solberg government submits a proposal for the scope of a strategic environmental impact assessment (EIA) of seabed mineral activities on the Norwegian continental shelf for public consultation.

10 September 2021 - The Ministry of Petroleum and Energy adopts a programme for the impact assessment of seabed mineral activities, based on 53 consultation responses.

27 October 2022 - The impact assessment for seabed mineral activities on the Norwegian continental shelf is submitted for consultation, with the deadline for responses set for 27 January 2023. A total of 1,065 responses are submitted, the majority of which are highly critical of the impact assessment.⁶⁴

20 June 2023 - The government proposes to open parts of the Norwegian continental shelf for commercial seabed mineral activities.

10 January 2024 - The Norwegian parliament approves the government's proposal for opening an area for mineral activities on the Norwegian continental shelf.

12 April 2024 - The King in Council formally decides to open an area in the Norwegian Sea and the Greenland Sea for mineral activities.

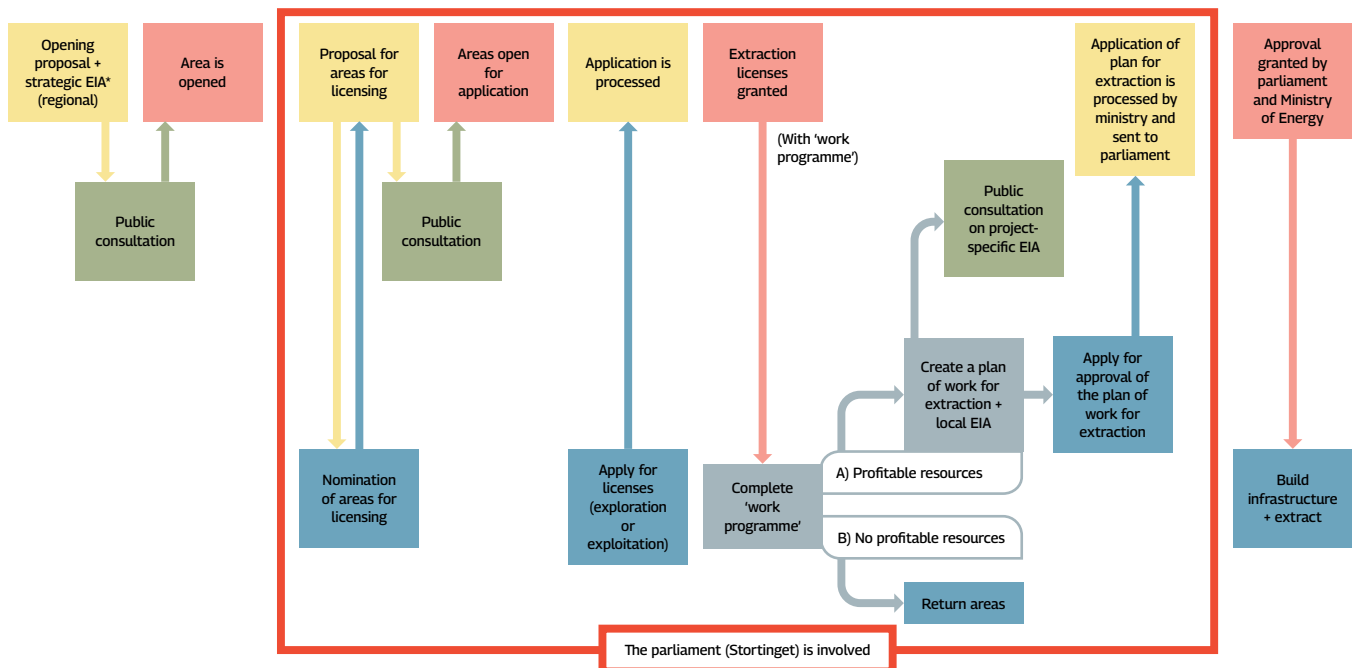
29 April 2024 - The Norwegian Offshore Directorate invites industry actors to nominate areas for the first licensing round for seabed minerals.

21 May 2024 - The nomination process for industry actors concludes. All invited actors except Leonhard Nilsen og Sønner (LNS) nominate areas.

26 June 2024 - Public consultation of the areas for the first licensing round for seabed minerals begins. The Ministry of Energy sets out the areas where companies can apply for exploitation licences, so that exploration on the Norwegian continental shelf can begin.

26 September 2024 - Deadline for public consultation responses on the areas for the first licensing round for seabed mineral activities.

The state decision process



*Environmental impact assessment



3.2 NORWAY'S REASONING FOR OPENING UP PART OF ITS SEABED TO DEEP SEA MINING

Norway has a stated ambition to be a world leader in deep sea mining⁶⁵ and has given a number of reasons to justify its decision to start deep sea mining activities.

Norway claims to have significant anticipated mineral resources on the seabed and argues that extraction of seabed minerals could become a new and important industry for the country⁶⁶ – yet, according to a press release from the Norwegian government on 20 June 2023, 'Currently, there is insufficient knowledge of extraction technologies and development solutions to assess potential ore deposits and estimate extraction rates.'⁶⁷

In the press release announcing the green light for mapping and exploration for seabed minerals, the Norwegian government argues that the world

needs these minerals to succeed in the green transition, and that deep sea mining must be considered because of the current geopolitical context where extraction of many minerals is largely controlled by a few countries and companies.⁶⁸

In several interviews and debates, Norway's Minister for Energy, Terje Aasland, has been among the actors that claim that Norway needs to mine the seafloor to outcompete existing mineral suppliers, because today 'we are getting minerals from China, who extracts them in Congo, where we have no control over either the environment or human rights.'⁶⁹ Notably, no mention of mining conditions, concerns for labour rights or child labour in mining areas, or any related topics were mentioned in the Norwegian government's new 'Strategy for Norwegian engagements with African countries'⁷⁰ launched in August 2024.

Norway also points to its offshore record, saying it is prepared for deep sea mining because of its extensive experience in business operations and sustainable management of ocean areas and arguing that 'mapping, exploration, and closure have minimal environmental impact'.⁷¹

In line with this rationale, a key argument for the Norwegian government is the idea that there is transferability between the technologies, knowledge clusters and competencies accumulated in the oil and gas sector since the first oil was found in Norwegian waters in 1969.⁷² But as Dr. John Jamieson, the Canada

Research Chair in Marine Geology at Memorial University of Newfoundland, explained in an interview with the Norwegian national broadcaster NRK in January 2024, 'Both industries entail working in the deep ocean, and mapping the seafloor. When it comes to exploration, assessment and exploitation, deep sea minerals and petroleum are two very different industries.'⁷³

This concern was shared by the Confederation of Norwegian Enterprise in 2017, when they gave their public consultation response to the proposed Seabed Minerals Act: 'Despite some similarities between exploitation of mineral and petroleum resources, the differences between the two industries are significant. The [mining] industry draws attention to the fact that the proposed law is closer to the petroleum legislation of today, rather than the Minerals Act, which is remarkable as this law is rather new and has been tailored to mineral resources and the needs of the industry that extracts these resources.'⁷⁴ Interestingly, the Confederation went on to adopt a pro-deep sea mining position and has not repeated these concerns.⁷⁵

Finally, another key rationale behind the opening has been that the Norwegian government wants private capital to fund exploration of the deep sea, to gather more data in order to clarify whether and how deep sea mining can be done in a sustainable way.⁷⁶



Protest outside the offices of Adepth Minerals in Bergen.
© Jason White / Greenpeace



3.3 CRITICISM OF NORWAY'S DECISION TO OPEN THE AREA TO DEEP SEA MINING

There has been extensive criticism of the reasoning by the Norwegian government by environmental organisations,⁷⁷ research institutions,^{78, 79, 80, 81} the fishing industry,^{82, 83} commerce^{84, 85, 86} and politicians,^{87, 88, 89, 90} as well as from international actors, among these the European Parliament⁹¹ and Dr Anne Larigauderie, Executive Secretary of the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES).⁹²

Key criticisms of the government's proposal to open up part of the Norwegian continental shelf for deep sea mining concern perceived shortcomings in the impact assessment, the government's lack of justification for seabed mining and questions

regarding whether the Ministry of Energy adequately considered and addressed the issues raised in the public consultations leading up to the proposal. Questions have also been raised about the apparent disregard of decision-making principles prescribed by domestic law and 'the potential for Norway to breach its obligations under international law to protect and preserve the marine environment'.⁹³

3.3.1 Lack of knowledge and weaknesses in the impact assessment

One of the strongest critics of the Norwegian government's opening of the area for deep sea mining, adding its voice to the concerned public, numerous environmental organisations and independent research institutions, was the Norwegian Environment Agency. This agency is the government body responsible for managing Norwegian nature and climate, preventing pollution and ensuring that Norway adheres to impact assessment law and relevant international conventions. The strategic impact assessment uncovered vast

knowledge gaps concerning the biodiversity in the area the government proposed to open for deep sea mining, the technology expected to be utilised by the industry and the environmental impacts of industry activities. This led the Norwegian Environment Agency to conclude that there was not a sufficient scientific or legal basis for the opening.⁹⁴

'This led the Norwegian Environment Agency to conclude that there was not a sufficient scientific or legal basis for the opening.'

As mentioned above, the Norwegian government has argued that opening up the area will improve knowledge about it, as private capital is generated to fund mapping and exploration. A key concern of the Institute of Marine Research (IMR)⁹⁵ and the Norwegian Environment Agency⁹⁶ is that the Norwegian government will depend on the companies collecting the data about the deep sea environment, rather than this work being led by the MAREANO programme, a collaboration between the IMR, the Geological Survey of Norway and the Norwegian Mapping Authority, which has been tasked with mapping of the seabed in Norwegian

offshore areas.⁹⁷ The Centre for Deep Sea Research at the University of Bergen also stated its concern that it is unlikely that private companies will be able to fill in a large portion of the knowledge gaps, which it argues would require a significant government effort.⁹⁸

Furthermore, the additional data collection will not entail a formal process for a holistic assessment of the regional or cumulative impacts of deep sea mining activities.⁹⁹ The companies will only be obligated to conduct project-specific environmental impact assessments before they are granted the final approval to start mining. Due to the vast gaps in knowledge outlined in the strategic impact assessment, these project-specific assessments will be unable to properly assess the broader impacts of this new industry on the wider ocean ecosystems and other ocean industries, such as fisheries.¹⁰⁰

In the government's proposal for opening the area for deep sea mining, it is stated that the government will 'initiate further mapping of natural and environmental conditions' and 'survey environmental conditions in the area that are relevant for mineral operations, through the Mareano programme'.¹⁰¹ Despite this, no new or additional resources have been allocated in the state budget to either the IMR¹⁰² or the MAREANO programme for vital research into and detailed mapping of the topography, biodiversity and habitats of the seabed, compared to earlier budgets.^{103, 104} Nor has the Norwegian Environment Agency been given any additional human or material resources.¹⁰⁵

3.3.2 Lack of justification for deep sea mining

The justification for deep sea mining outlined in the Ministry of Energy's white paper¹⁰⁶ was also criticised from a number of angles. One concern was that the resource assessment on which the opening proposal was based was not included in the public consultation on the strategic impact assessment. In addition, this resource assessment was not conducted by the Norwegian Geological Survey, which has expertise in mineral assessments, but instead by

the Norwegian Offshore Directorate, which up until January 2024 was named the Norwegian Petroleum Directorate, and whose stated primary objective is to 'contribute to the greatest possible values for society from the oil and gas activities'.¹⁰⁷

It is not clear why the Norwegian government has chosen to divide the administration of the country's mineral resources among two separate agencies. What's more, the methodology used by the Norwegian Offshore Directorate was heavily criticised by the Norwegian Geological Survey for being overly optimistic, and the institution later released its own resource assessment in which it estimated almost half the amount of copper per 1,000 km² and a 35% lower copper content in the deposits compared to the estimate made by the Norwegian Offshore Directorate.¹⁰⁸

An independent report by Bergfald Miljoradgivning [Bergfald Environmental Consultants] separately assessed the resource estimates provided by the Norwegian Offshore Directorate, and was highly critical of the claim that sufficient mineral resources exist to serve as the basis for a new seabed mining industry.¹⁰⁹ The report was also critical of the methodology used by the directorate, which, rather than basing the assessment on industry standards – such as the Australian JORC standard¹¹⁰ and the Canadian NI 43-101,¹¹¹ which both are widely used and approved by the Committee for Mineral Reserves International Reporting Standards (CRIRSCO),¹¹² a global collaboration initiated in order to secure more accurate reporting of minerals and prevent fraud in the mining industry – created its own methodology based on models from the petroleum sector.¹¹³

Bergfald Miljoradgivning argues that as one of the key arguments of the Norwegian government was that opening the seabed for deep sea mining would generate private capital for mapping and development of the industry, the government should have followed one or more of the existing industry standards for reporting mineral resources.¹¹⁴ Furthermore, the report claims that the definition of mineral resources and resource assessments used by the Norwegian Ministry of Energy is not in line with the definitions used by CRIRSCO.¹¹⁵

Bergfald Miljoradgivning's report also makes an independent assessment of the mineral occurrences so far documented on the Norwegian

continental shelf. The consultancy criticises the Norwegian Offshore Directorate for basing its estimates heavily on a few samples rich in copper and manganese, and extrapolating these findings to the whole of the Arctic Mid-Ocean Ridge. The report states that there is not sufficient data to make these claims, nor to claim that the occurrences are large and rich enough to sustain financially viable mining in the deep sea.¹¹⁶

Another key criticism, particularly raised by the Norwegian Geological Survey¹¹⁷ and commercial actors such as KLP¹¹⁸ and the Eyde-cluster,¹¹⁹ is that the Norwegian government has largely overlooked the possibility of meeting mineral demand through already mapped resources on land and through a transition to a circular economy, in line with the ambitions of both the Norwegian Mineral Strategy¹²⁰ and the European Green Deal.¹²¹ The assumption that deep sea mining would be necessary in order to secure a green transition was disproven in an independent report from the research institution SINTEF.¹²² The European Academies Science Advisory Council also released a statement calling the claim that deep sea mining would be essential to meeting climate targets misleading.¹²³

There are criticisms about the economic viability of deep sea mining as well, because of technical challenges and high operational costs.¹²⁴ In his previously mentioned interview with NRK in January 2024, Dr. Jamieson explicitly called out Norwegian politicians for 'being too optimistic' about the commercial potential and economic sustainability of Norwegian deep sea mineral deposits.¹²⁵ He also questions the technological transferability of infrastructure and competence from Norwegian oil and gas extraction, which is a core argument for politicians and the lobby justifying deep sea mining in Norway.

In August 2024, Hans Petter Klohs, co-founder of Adepth Minerals, proposed that the government should fund gathering of environmental data and that the deep sea mining industry should be granted the same tax benefits as the petroleum industry in Norway, where the state guarantees for and thus carries the economic risk for exploration.¹²⁶ However, this idea was rejected by the Minister for Energy, Terje Aasland, who stated that 'It is not appropriate for the government to introduce such a reimbursement scheme'.¹²⁷

3.3.3 Disregard for domestic decision-making processes

Leading national academics have concluded that the Norwegian government and parliament have lacked transparency in the process to open up the Norwegian continental shelf to deep sea mining.¹²⁸ These conclusions are based on three main observations:

- Due to the significant weaknesses in the impact assessment, the government has not provided the Norwegian public with sufficient information about the impacts of the political decisions.
- Sections 8-10 of the Norwegian Nature Diversity Act establish knowledge-based decision making and the precautionary principle as principles that should inform all official decision making where nature could be impacted.¹²⁹ Because of the aforementioned extensive knowledge gaps, it is highly questionable whether there is currently sufficient knowledge to authorise deep sea mining activities. The precautionary principle in the Norwegian law does not prohibit activities with unknown effects from taking place altogether, but it does require the adoption of precautionary measures from an early stage on substantive, procedural and institutional levels.
- Both the Norwegian government and the Norwegian parliament have approved the opening in spite of widespread warnings from both governmental agencies and other actors that the information the proposal was based on is incomplete, flawed and misleading, and without convincingly responding to the stated concerns.

3.3.4 International criticism

Norway's decision to open parts of its continental shelf for deep sea mining has also sparked sharp criticism from abroad. For example:

- In November 2023, 119 European parliamentarians signed a letter expressing concern over Norway 'pushing forward this destructive industry, rather than joining the EU in the transition to a circular economy'.¹³⁰
- After the Norwegian government announced that it was opening its seabed for deep sea mining, the European Parliament passed a resolution reaffirming the call for a moratorium, expressing concerns over the opening process and pointing to Norway's international obligations to avoid significant transboundary impacts and to protect the marine environment.¹³¹
- Concerns over the Norwegian plans to mine the seabed were also expressed by the Council of the European Union on 25 June 2024.¹³²
- As a result of Norway's stated ambition to begin deep sea mining, more than 30 organisations¹³³ called for the country to step down as co-chair of the High Level Panel on a Sustainable Ocean Economy (the Ocean Panel). The internationally renowned journal *Nature* also called Norway's leadership into question,¹³⁴ and four scientists that had advised the panel joined the call for the country to step down as co-chair.¹³⁵
- Due to the heavy criticism, the Norwegian Ministry of Foreign Affairs asked Norwegian embassies to report back on how the news had been received abroad. Several embassies reported that the media coverage was massive and that there was widespread scepticism - among these the embassy in Brazil, which wrote that 'Norway's international reputation as a responsible actor on environmental policy has been called into question'.^{136, 137}

The international movement against deep sea mining is growing. This was clear at the International Seabed

Authority (ISA) meeting in July-August 2024, with five additional countries joining the call for a moratorium or a precautionary pause on the start of deep sea mining, bringing the total to more than 30 states taking a stand against the controversial practice.¹³⁸ Norway's close neighbours in Denmark, the Faroe Islands and Kalaallit Nunaat (also known as Greenland) joined the call for a precautionary pause on deep sea mining in international waters in March 2024, shortly after the Norwegian opening was announced.¹³⁹

A resolution calling for a moratorium on deep sea mining in international waters has been proposed to the Nordic Council, and will likely be voted upon by the end of 2024.¹⁴⁰ The Nordic Council is the formal institution for inter-parliamentary cooperation between Norway, Denmark, Sweden, Finland and Iceland, plus the autonomous territories of Greenland, the Faroe Islands and Åland. Their resolutions are recommendations, and not legally binding, but such a resolution would be a strong signal to Norway and underline the country's position as an outlier on the international stage.

3.4 NORWAY'S LEGAL FRAMEWORK

A proposal for a Seabed Minerals Act was sent for public consultation in 2017. Even then, the Norwegian Environment Agency warned that the proposed law could result in deep sea mining activities in areas where the biological diversity has not been sufficiently mapped.¹⁴¹ The agency's assessment was disregarded by the Ministry of Energy,¹⁴² and the law was passed by the Norwegian parliament on 12 February 2019. On 1 July 2019, the Seabed Minerals Act took effect, providing the legal framework for seabed mining in Norway.

In January 2021, the Ministry of Energy proposed a programme for the strategic environmental impact assessment of mining the Norwegian continental shelf.¹⁴³ The proposal was heavily criticised by the Norwegian Environment Agency for being initiated

before rules and regulations relating to the industry had been developed, for proposing an area that was far too large and largely unmapped, and for lacking proper involvement of the parts of the Norwegian government with expertise on environmental impacts and assessments.¹⁴⁴ The Centre for Deep Sea Research at the University of Bergen strongly urged the government to allocate sufficient time to ensure a proper understanding of the deep sea environment before exploration and exploitation were allowed to proceed.¹⁴⁵

However, despite those criticisms, the Ministry approved the impact assessment programme on 10 September 2021.¹⁴⁶

The strategic impact assessment was released for public consultation on 27 October 2022, 13 months after the programme was approved, and it received 1,065 responses.¹⁴⁷ As described earlier, the majority of these responses expressed serious concerns. Some of the strongest criticism again came from the government's own Environment Agency, which concluded the impact assessment does not provide a sufficient scientific or legal basis for deep sea mining.¹⁴⁸

Activities outlined as falling under the category of 'survey' (*undersøkelser*) under the Seabed Minerals Act §1-5 c include 'exploration for and mapping of mineral deposits for commercial purposes, including geological, geophysical, geochemical and geotechnical activities and operation and use of facilities to the extent they are used for survey activity'.¹⁴⁹ The Minister for Energy, Terje Aasland, elaborated in September 2024 that 'shallow drilling, and the collection of minerals to map mineral deposits, determine prevalence, mineral content and commercial value will be covered by the term "survey"'.¹⁵⁰

The Institute of Marine Research advised against the opening, stating that there are 'large gaps in our knowledge about the nature conditions and bottom currents' and that 'this lack of knowledge makes it impossible to objectively assess the impacts of mineral extraction'.¹⁵¹ The Centre for Deep Sea Research at Bergen University likewise asserted that much more knowledge is needed before companies can be permitted to extract minerals from the seabed, and agreed with the conclusion that exploration would have limited environmental impacts only on the condition that the methodology used was similar to what

had been used in scientific research so far.¹⁵² Their response also stated that before any activities take place, a legal framework for exploration must be developed, making it clear what kinds of activities are allowed in the exploration phase, setting out requirements for environmental impact assessments in proposed exploration expeditions and clearly indicating which areas are closed off for exploration, based on scientific criteria.¹⁵³ The president of the Norwegian Academy of Science and Letters, Lise Øvreås, voiced concern as well, stating that her biggest worry was that opening up the proposed area for mining would cause irreparable ecosystem damage.¹⁵⁴

Despite the array of criticisms, there is no publicly available evidence that the Ministry of Energy requested additional assessments or further investigation.

On 1 January 2024, Norway's Petroleum Safety Authority (*Petroleumstilsynet*) was renamed the Norwegian Ocean Industry Authority (*Havindustriilsynet*, or *Havtil*).¹⁵⁵ According to a statement in the 2024 issue of the agency's journal, *Dialogue*, 'In 2022, responsibility was delegated for safety and emergency preparedness in future recovery of seabed minerals from the NCS [Norwegian Continental Shelf]. Such deposits are currently being mapped with the aid of technology and expertise from the petroleum industry'.¹⁵⁶

The Norwegian Ocean Industry Authority reportedly intends to start the process of developing rules and regulations on security and the work environment for the deep sea mining industry in 2024.¹⁵⁷ In answer to a formal question from the MP Lars Haltbrekken (Socialist Left Party, SV), the Minister for Energy, Terje Aasland, stated that 'Relevant parts of the HSE [health, safety and environment] regulations must be in place before exploitation permits are awarded'.¹⁵⁸ This raises the questions of whether the government is looking to green-light exploration activities before health, security and work environment regulations for the industry are in place and whether it intends to hand out exploitation licences before these regulations are fully set.

3.5 CRITICISM OF THE NORWEGIAN GOVERNMENT'S LEGISLATION ON DEEP SEA MINING

Environmental groups, lawyers and academics have strongly criticised the Norwegian government's moves to open up the Norwegian seabed to deep sea mining.

The legal opinion submitted by WWF states that the impact assessment requirements laid out in Section 2-2 of the Seabed Minerals Act have not been satisfied. It concludes that the impact assessment falls far short of the requirement to be 'sufficiently detailed to serve as a basis for the decision to open an area for exploration and exploitation', arguing that it 'adopts a far too general and overarching approach to the environmental consequences ... [and] pays insufficient attention to varying local environmental conditions of the large area under consideration'.¹⁵⁹ Other criticisms include insufficient consideration of the Nature Diversity Act and the precautionary principle, with the observation made that 'The significant size of the proposed area to be opened increases the risk of irreversible damage and strengthens the obligation to adopt a precautionary approach'.¹⁶⁰

According to WWF, the government also overlooked the very clear consultative statements by the Norwegian Environment Agency. This continues a tendency where statements from the government's own environmental experts are ignored, as shown by *Naturvernforbundet* in 2017 regarding the petroleum industry.¹⁶¹ What is quite remarkable is that the government disregarded the statements despite the agency being explicit in its opinion that there is no juridical basis for the opening process¹⁶² – in other words, according to the Norwegian Environment

Agency the opening could be found illegal if tested in a court of law.

Norway has a number of obligations under international law such as the Espoo Convention¹⁶³ and the SEA Protocol.¹⁶⁴ These include obligations to conduct impact assessments, publish environmental information and prevent transboundary harm.

As a state party to the United Nations Convention on the Law of the Sea (UNCLOS), Norway is bound by its obligations, including the general mandate to protect and preserve the marine environment. Une Bastholm, MP for the Green Party (MDG), is as of August 2024 considering formally raising an issue on the opening process in the parliamentary Standing Committee on Scrutiny and Constitutional Affairs. The question is whether the existing impact assessment is adequate, or if the points of criticism, especially those raised by the Norwegian Environment Agency, are sufficient to conclude that the duty of conducting a proper impact assessment was not met.¹⁶⁵

The scope of applicability of the Svalbard Treaty has also been raised as a point of contention. There is international and academic disagreement on whether or not the treaty is applicable within the 200 nautical mile (nm) zone around the Svalbard archipelago. Norway holds the position that this zone is subject to the same regulations as the Norwegian exclusive economic zone (EEZ) and around Jan Mayen island. Other parties to the treaty, such as the European Union, Iceland, the UK and Russia, hold the position that the Svalbard Treaty is applicable in this 200 nm zone. Several academics have argued that Norway's decision to open areas of its claim to an extended continental shelf within this zone to deep sea mining might contribute to heightened tensions in the region, particularly as the Norwegian parliament requested that the government take

national security concerns into account when awarding licences, as it could be interpreted as in breach of the non-discrimination principle in Article 3 of the treaty.^{166, 167}

Another key criticism of the Norwegian legislation is that the law does not sufficiently separate exploration and exploitation. Several of the public consultation respondents, such as the Centre for Deep Sea Research at the University of Bergen,¹⁶⁸ indicated that they were unsure if the area was being opened only for exploration licences or also for exploitation and expressed caution about extraction going ahead. However, despite the stated concerns, in the white paper proposing the opening the Norwegian government stated that 'It is not relevant to only open for exploration as some have recommended. It is the prospect of profitable extraction that will be the driver for commercial actors' seabed mineral activities.'¹⁶⁹ As this framing shows, the government is firmly set on exploitation, no matter what insights on environmental impacts are gained during the exploration phase.

As described earlier, several of the public consultation responses strongly urged the government to refrain from proceeding with licensing until there is a clear legal framework for the industry, particularly as it relates to environmental standards, and a clear indication of which activities will be permitted by the licences during the different phases of exploration and exploitation. No regulations have so far been announced or sent for public consultation, but the Ministry of Energy has already started the first licensing round and has stated that it aims to begin granting exploitation licences by the first half of 2025. The licensees will supposedly be required to perform an exploratory mapping phase and submit a plan for exploitation showing 'that the project can be implemented in a sustainable and

responsible manner' before extraction can begin.¹⁷⁰ The Norwegian government reportedly aims for mining to start as soon as 2030.¹⁷¹

3.6 CONCLUSION

Norway is aggressively pushing the development of the deep sea mining industry, opening up an area covering 281,200 km² of mid-ocean ridge¹⁷² - almost the size of Italy¹⁷³ - and proceeding with the first licensing round.

Norway has chosen to be one of the main advocates for this destructive industry at a time when a wave of other nations, international organisations and scientists are preaching caution.

The Norwegian government itself documented vast knowledge gaps as part of the opening process, but clearly disregarded the precautionary principle and the scientific advice it received as it moved forward with its plans to mine the Arctic seabed. Currently, the ISA is negotiating over whether or not to allow deep sea mining in the parts of the ocean outside any one country's jurisdiction.¹⁷⁴ Norway's initiative to open its own seabed for deep sea mining is putting pressure on the ISA, increasing the pace of what could be a devastating race to the bottom.

Greenpeace takes responsibility where the Norwegian government does not, and will continue to contribute to the scientific understanding of this vast and vulnerable area and the magnificent life that exists there.

4. THE CORPORATE STAKEHOLDERS



Protest outside the offices of Adepth Minerals in Bergen. © Jason White / Greenpeace

4.1 WHY DO COMPANIES WANT TO MINE THE SEABED?

The rapid expansion of clean energy technologies is boosting the demand for rare earth elements and minerals such as lithium, copper, manganese, nickel and cobalt that are essential components in electric vehicles and renewable energy generation, storage and transmission.¹⁷⁵ Industrial players like Loke Marine Minerals,¹⁷⁶ Green Minerals,¹⁷⁷ Adepth Minerals¹⁷⁸ and The Metals Company (TMC)¹⁷⁹ claim that the demand can be met in a sustainable way by deep seabed mining.

A recently published report by the Environmental Justice Foundation¹⁸⁰ provides explanations why these industry arguments are flawed. The researchers emphasise that the arguments put forward in favour of deep sea mining are not valid from either an environmental or an economic/geological perspective. An important argument is that primary demand for metals such as copper, nickel and cobalt that could be extracted with deep sea mining can be reduced significantly through recycling,

as these metals are infinitely recyclable and extractable with high recovery rates. In addition to highlighting the importance of a fully circular 'recycling and reuse' economy for this purpose and to tackle the climate problem more generally, the report also outlines the inherent uncertainties of scenario modelling and demand projections, questioning the need for deep sea resources to support the energy transition in the first place.

In 2023, a study from the German Oeko-Institut commissioned by Greenpeace Germany¹⁸¹ demonstrated that the mining of deep sea materials has a far lower potential for securing raw materials for the green energy transition than often portrayed. The study concludes that a successful energy and mobility transition does not depend on deep sea mining, because only three materials - cobalt, nickel and manganese - could be extracted from polymetallic nodules or crusts in the deep sea in volumes relevant for the world market. The most needed mineral, lithium, is not a target of deep sea mining activities.

As the deep sea mining industry's arguments about serving the green energy transition have been called into question, some companies have pointed to other industrial applications. In the US, lawmakers this year introduced a bill to Congress that pushes for mining the seabed because establishing a secure and resilient critical mineral supply chain is seen as a matter of national security to help secure metals

to use in weaponry, among other applications.^{182, 183, 184} The argument that the seabed and precious ocean life should be destroyed to fuel geopolitical competition or for materials to wage war is a relatively new one, but it has been advanced by companies like TMC.^{185, 186} In Norway, companies and industry organisations tend to argue that mining the deep sea is key in a geopolitical competition for mineral resources.^{187, 188, 189}

Another argument for deep sea mining says that it will provide new income streams for nations, for example through profits of state-owned mining companies and taxes or royalties to be paid by private mining companies. Nongovernmental organisations (NGOs) such as the Environmental Justice Foundation¹⁹⁰ and Greenpeace International have argued in previous publications¹⁹¹ that mining the deep sea will exacerbate inequalities. The deep sea mining industry is dominated by private sector companies, located overwhelmingly in the Global North, whose potential profits would largely flow to their shareholders and investors. States in the Global South that sponsor foreign companies working through subsidiaries will take on much of the environmental, legal and financial risk, while gaining only a small fraction of the proceeds, and scant attention has been paid in ISA negotiations to the vast majority of nations that do not have any interests in deep sea mining.

4.2

ALTERNATIVES TO DEEP SEA MINING FOR THE ENERGY TRANSITION

There are significant uncertainties about the amounts of metals that will ultimately be needed for the green energy transition, especially in electric vehicles and in transportation in general.¹⁹² What deep sea mining companies do not consider is that the technologies in question are developing rapidly and are expected to require far fewer critical minerals in the future for the same or improved performance.¹⁹³ Furthermore, an optimised circular economy holds immense potential for the recovery of metals from materials already in circulation.¹⁹⁴ These factors together are likely to challenge the trend of increasing demand forecasts.

Reasons why deep sea mining isn't necessary for the transition to electric vehicles include:

1. Cities and countries around the world are moving to more sustainable mobility.¹⁹⁵ Many forecasts for global battery demand are based on projections for a transition from conventional to electric vehicles.¹⁹⁶ They assume that transportation patterns based on privately owned passenger cars, including continuous annual growth rates, will continue over the decades to come – but it is hard to predict how the numbers and the growth rates will develop, not only from a resource demand perspective, but also because of the realities of urban agglomerations. More and more cities are seeing the benefits of fewer cars, whether electric or not.¹⁹⁷ Accessible public transport, walking, cycling and more shared journeys make cities more affordable, cleaner, safer and healthier. This trend will reduce demand for battery metals.

2. Car companies are now using and developing new electric vehicle battery chemistries without cobalt and nickel¹⁹⁸ – two of the metals targeted by deep sea mining activities. Much more promising are the developments in lithium iron phosphate (LFP, also known as lithium ferro phosphate or LiFePO₄) batteries, in which lithium is the only critical mineral. LFP reportedly already supplies around 40% of the demand in the electric vehicle market globally,¹⁹⁹ and lithium is not one of the principal targets of deep sea mining. Emerging technologies like sodium-ion batteries also hold great promise for reducing the demand for critical minerals.²⁰⁰ And in the future, a shift to smaller, more efficient cars could further reduce the amounts of battery metals needed.

3. Improvements in recovery and recycling of waste, including battery materials, alongside advances in collection and recycling policies, will mean less need for new mining. The World Bank estimates that a significant increase in the recycling rate for used batteries by 2050 could reduce the demand for primary minerals such as copper, nickel, cobalt and lithium by as much as a quarter.²⁰¹ A recent EU law requires that lithium-ion batteries that are used in electric vehicles must be recycled at their end of life.²⁰² Although recycling processes are still being developed and optimised, it is already possible to recover various embedded raw materials at high efficiencies – for example, cobalt and nickel have an estimated recycling efficiency of 95% and copper 80%,²⁰³ and even higher recovery rates are reported (up to 99.6% for nickel and cobalt and 95% for lithium²⁰⁴). Development of processes and recycling infrastructure for Li-ion batteries is currently focused on a few Asian, European and North American countries such as China, South Korea, Japan, Belgium, Finland, France, Germany and the US.²⁰⁵

The only way to fairly transition away from fossil fuels is by reducing demands on our exhausted planet – not by drilling and dredging in some of the last untouched and unique marine environments, but by following these principles:

- Prioritise critical minerals for energy transition
- Reduce demand for minerals, e.g. through substitution, efficiency, circularity and modal shifts (sufficiency)
- Prioritise what we already have and promote reuse, e.g. through developing and scaling recycling technology
- Protect sensitive areas like the deep sea and key terrestrial environments, protecting people (including Indigenous people and local communities) while ensuring the highest environmental, social and governance standards
- Embed justice and equity in all critical minerals development

4.3

CONNECTIONS TO THE OIL AND GAS INDUSTRY

A deep dive into the three most vocal deep sea mining companies in Norway – Loke Marine Minerals AS, Green Minerals AS and Adepth Minerals AS – shows that their leadership more often than not hails from the oil and gas industry or, in a few cases, the finance and banking sectors.^{206, 207, 208} Similarly, among the employees who are featured on the companies' websites, none appear to have backgrounds in fields such as marine biology or ecology. This calls into question whether these companies hold the relevant competencies to properly assess and monitor the environmental impacts of their activities.

4.4 MINING COMPANIES

4.4.1

loke

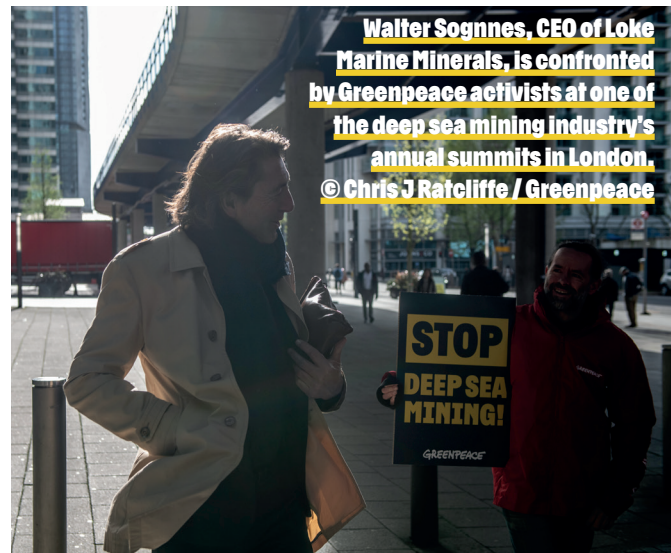
Company: Loke Marine Minerals AS²⁰⁹
Address: Sørengata 4, 4006 Stavanger
CEO: Walter Sognnes

Main Reported Shareholders (Direct and Indirect) in 2023²¹⁰

Name	Shares held (%)	Reported connections ²¹¹
Wilh. Wilhelmsen Holding ASA	21.01	
FMC Technologies BV	15.95	Part of TechnipFMC Plc
La Strada AS	13.13	Listed shareholders are Hans Olav Hide (31.63%), Ask Rørnes Hide (22.79%), Mengel Live Hide (22.79%) and Hogne Rørnes Hide (22.79%)
Waci Invest AS	13.12	100% owned by Walter Sognnes
Tore Halvorsen	12.43	Presumably, Loke's chief technical officer ²¹²

Licences:

Loke is pursuing exploitation licences in the area that the Norwegian government opened up for mining on Norway's claim to an extended continental shelf. In addition, through its ownership of UK Seabed Resources (UKSR), Loke holds two contracts for the exploration for polymetallic nodules in the Clarion-Clipperton Zone in the Pacific Ocean, covering an area of 133,000 km² at depths of 4,000–5,500 m.²¹³



Reported deep sea mining partners:

- TechnipFMC Plc (UK): Full lifecycle services provider for subsea and surface operations²¹⁴
- Wilh. Wilhelmsen Holding ASA: Port and ship service²¹⁵
- NorSea Group (Norway): Logistic service provider²¹⁶ (Wilhelmsen owns 99% of NorSea)²¹⁷
- Kongsberg Gruppen ASA: Investor and technology provider^{218, 219}

Loke acquired UK deep sea mining company UKSR in 2023 from Lockheed Martin UK,²²⁰ a company active in the defence sector.²²¹ Lockheed Martin UK is the UK-based arm of Lockheed Martin Corporation, the world's largest weapons manufacturer.²²²

What Loke Marine Minerals says about deep sea mining:

Loke Marine Minerals has been reported to have outspoken ambitions to become the world's largest producer of seabed minerals.²²³ The company is seeking to mine nodules and manganese crusts on the seafloor.²²⁴ The pursuit of deep sea mining has been met with resistance from Indigenous communities, particularly in the Pacific,^{225, 226} but also by the Saami Council²²⁷ and the Inuit Circumpolar Council Greenland.²²⁸ Loke claims to aim for extracting deep sea minerals using eco-friendly technology and rigorous environmental monitoring, but has also admitted that 'we have not proven yet that [deep sea mining] is sustainable'.²²⁹

CEO Walter Sognnes reportedly stated in a BBC interview in 2024 that it will be costly to research deep marine environments and that he estimates actual extraction will not begin until the early 2030s.²³⁰ In an interview with the *Financial Times*, Loke Marine Minerals chairman Hans Olav Hide argued that deep sea mining is necessary due to geopolitical competition: 'If you build a battery factory you will get funding from governments. But if you ask where it will get minerals from, it will be from China or Russia.'²³¹

4.4.2



Company: Green Minerals AS²³²
Address: Nedre Slottsgate 8, 0157 Oslo
CEO: Ståle Monstad

Main Reported Shareholders (Direct and Indirect) in 2023²³³

Name	Shares held (%)	Reported connections ²³⁴
Telinet Invest AS	11.95	Largest shareholders listed as Bjørn Gaarder Arctander (28.05%) and Finn Erik Gaarder Arctander (28.05%)
Anderson Invest AS	8.24	Shareholders listed as Jan-Thomas Anderson (73.3%) and Jan Henry Anderson (26.7%)
Grunnfjellet AS	4.23	Shareholder listed as Per Øyvind Berge (100%)
Møsbu AS	3.52	Shareholder listed as Gunnar Evensen (100%)
Storfjell AS	3.40	Shareholder listed as Roar Rodahl Ståle (100%)

Note: Green Minerals reports more recent shareholder information on its own website, according to which Telinet Invest AS has increased its shareholding substantially to 24.14%, with a previously minor investor, Citibank NA, now ranking third with 3.97%, as of 13 September 2024.²³⁵

Licences:

Green Minerals is seeking to mine sulphide deposits on the Norwegian continental shelf²³⁶ and reportedly has a Memorandum of Understanding with 'a competent and renowned international licence holder' to exploit an area in the Clarion-Clipperton Zone for metallic nodules.²³⁷

Reported deep sea mining partners:

- Seabird Exploration Norway AS:²³⁸ Green Minerals started as a spin-off of SeaBird Exploration Plc.²³⁹ SeaBird manages the company through a management agreement and provides seismic services.²⁴⁰
- Oil States Industries (OSI; US):²⁴¹ Partner for deep sea mining and transport of ore to port.²⁴² OSI has been reported to also provide risers for TMC's Nauru Ocean Resources Inc (NORI) project.²⁴³
- Soil Machine Dynamics Ltd (SMD; UK):²⁴⁴ Specialist in building deep sea mining vehicles.²⁴⁵
- RiserTec Ltd (Scotland):²⁴⁶ Engineering consultancy specialising in riser, pipeline, mooring and subsea engineering.²⁴⁷

What Green Minerals says about deep sea mining:

Green Minerals plans to explore seafloor massive sulphide deposits, from which copper can be extracted by drilling into the seabed crust, and is developing mining technologies that can work at the extreme depths of the seabed floor.²⁴⁸ The company expects to acquire a licence from the Norwegian government in early 2025 and to start test mining as early as 2028.²⁴⁹

According to media reports, Green Minerals claims that because SMS deposits are small (around 200m in diameter) and no permanent infrastructure or installation is needed on the seabed, the impact of its mining activities on the environment will be 'very limited'.²⁵⁰ This assertion is not backed up by scientific assessments. On the contrary, these deposits resulting from hydrothermal activity can be associated with vulnerable marine ecosystems (VMEs), and several such areas have been pointed to as good candidates for marine protection areas by the Norwegian Institute for Marine Research.²⁵¹

CEO Ståle Monstad has been reported to argue that any data collected by the company would not be biased, claiming that 'We have no intention of hiding or doing anything unethical with the data.' He has also been quoted as saying that he is happy to accept NGO representatives onto Green Minerals' boats as observers and insists they will not go ahead if it would risk 'severe damage to the environment'.²⁵²



4.4.3



Company: Adepth Minerals AS²⁵³
Address: Solheimsgaten 7c, 5058 Bergen
CEO: Anette Broch Mathisen Tvedt

Main Reported Shareholders (Direct and Indirect) in 2023²⁵⁴

Name	Shares held (%)	Reported connections ²⁵⁵
Deepocean Investco 1 AS	55.00	Shareholder listed as Deepocean Group Holding AS (100%)
Carthea AS	10.37	Shareholder listed as Petter Amundsen Klohs Hans (100%)
Seabed Solutions AS	9.76	Largest shareholders listed as Jan Aas (35.2%) and Petter Amundsen Klohs Hans (33.6%)
Waela AS	7.10	Shareholder listed as Werner Svellingen (100%)
Eadu AS	7.10	Shareholder listed as Bjarte Hellevang (100%)

Licences/Projects:

- Eco-Safe Ridge Mining Project (ESRMP)²⁵⁶
- Energy Minerals for the Netzero Transition (EMINENT)²⁵⁷

The company has not released an exact timeline for starting seabed mining on the Norwegian continental shelf.

Reported deep sea mining partners:

- DeepOcean Group:²⁵⁸ Provides remotely operated vehicles to offshore and seabed mining operations.²⁵⁹
- Seabed Solutions AS:²⁶⁰ Subsea machinery supplier, servicing the offshore wind, oil & gas, aquaculture and deep sea mining sectors.²⁶¹

What Adepth Minerals says about deep sea mining:

Adepth says it is collaborating with universities, government bodies and industry partners to develop what it claims are sustainable methods for exploring and extracting deep sea minerals.²⁶² The company has stated that it will only extract deep sea minerals if it can be done with a low environmental footprint.²⁶³

CEO Anette Broch M. Tvedt has argued that extracting copper from the seabed could cause less environmental damage than extracting it from land, if deep sea deposits offer a better rock-to-metals ratio. According to Tvedt, 'The data currently shows that the ore grade is potentially higher [in deep sea mining], which is very important, because that means you can dig out less and get out more. ... We will do better than the alternative - or there is no industry.'²⁶⁴

Deep sea mining is an extremely invasive and destructive practice, with potentially far-reaching and long lasting environmental effects.^{265, 266, 267, 268}

4.4.5



Company: Nordic Mining ASA²⁶⁹
Address: Munkedamsveien 45, 0250 Oslo
CEO: Ivar S. Fossum

Main Reported Shareholders (Direct and Indirect) in 2023²⁷⁰

Name	Shares held (%)	Reported connections ²⁷¹
Fjordavegen Holding AS	14.96	Largest shareholders listed as Grov Andre (22.4%) and Helgås Østerbø Thomas (22.4%)
Iwatani Corporation	14.74	
Morgan Stanley & Co Int Plc	10.80	
Citibank NA	3.25	
Nordnet Bank AB	2.41	

Licences/Projects:

Nordic Mining were among the earliest actors interested in deep sea mining in Norway, applying for exploration licences in several prospective areas in 2010 through subsidiary Nordic Ocean Resources AS (NORA)²⁷² and reportedly expressing interest in 2021 in seeking licences in the area the Norwegian government was considering opening for exploration.²⁷³ However, in August 2023 they stated that 'The lead time to develop and establish viable and commercial exploitation of seabed minerals resources is considered excessive compared to opportunities on land. Following a strategic review, Nordic Mining has therefore decided to pause the engagement in seabed minerals exploration.'²⁷⁴

4.4.6

Company: Quantum Marine Minerals AS
Address: Gimleveien 25 D, 1358 Jar
CEO: Fridtjof Arne Jebsen²⁷⁵

Company board:²⁷⁶

Board chairman: Jon Sandnes
Board member: Fridtjof Arne Jebsen
Board member: Dag Helland-Hansen

Key persons' background:

Fridtjof Arne Jebsen has worked in the energy sector for over 20 years, formerly with Saga Petroleum and Tellus Petroleum.²⁷⁷ Jon Sandnes is also a board member of the Norwegian Forum for Marine Minerals (NMM).²⁷⁸

4.5 SERVICE PROVIDERS

Seabed Solutions

Company: Seabed Solutions AS²⁷⁹
Address: Birkedalsveien 20, 4640 Søgne
CEO: Christian Aas

Main Reported Shareholders (Direct and Indirect) in 2023²⁸⁰

Name	Shares held (%)	Reported connections ²⁸¹
Ta Go Eiendom AS	35.24	Shareholder listed as Jan Aas (100%)
Carthea AS	33.56	Shareholder listed as Petter Amundsen Klohs Hans (100%)
NHB-Holding AS	6.96	Shareholder listed as Niels-Henrik Brodtkor (100%)
Phasma AS	6.71	Shareholder listed as Andreas Hveding Aubert (100%)
Meteigen AS	5.87	Shareholders listed as Jensen Jan Ivar Oddene (50%) and Hilde Aateigen Jensen (50%)

Projects:

Seabed Solutions provides offshore services such as submarine excavators. They claim that their 'Seabed Excavator' is 'the only excavator in the world capable of operating at 4000 metres depth', and thus is 'well suited for deep sea mineral exploration'.²⁸²

What Seabed Solutions say about deep sea mining:

Seabed Solutions is, like the government, rushing for Norway to 'utilise and capitalise on [their] technological and operational advantage in deep-water operations'.²⁸³ On its own website, the company is also quite vocal in pushing militaristic arguments for deep sea mining, claiming that 'it is necessary for NATO to gain a technological edge in deep-sea operations if the West is to be a global technological and economical center, for our democratic values to be continued, and to ensure that we get enough minerals to be able to realize the green shift. ... We are on our way into a more polarized international economy, and Norway has a responsibility to contribute with minerals and technological expertise to our partners within the NATO alliance'.²⁸⁴

4.6 INVESTORS



KONGSBERG

Company: Kongsberg Gruppen ASA²⁸⁵
Address: Kirkegardsveien 45, PO Box 1000, 3601 Kongsberg
CEO: Geir Haaoy

Main Reported Shareholders (Direct and Indirect) in 2023²⁸⁶

Name	Shares held (%)	Reported connections ²⁸⁷
Norwegian Ministry of Trade, Industry and Fisheries	50.02	
National Insurance Fund (UK)	5.97	
Folketrygdfondet	5.67	Manages the Government Pension Fund of Norway ²⁸⁸
Must Invest AS	2.53	Largest shareholders listed as Erik Christain Must (49.80%) and Trine Must (49.81%)
Northern Trust Corp (US)	2.45	Largest shareholder listed as The Vanguard Group Inc (10.81%) ²⁸⁹

Projects:

Kongsberg provides technology to explore and investigate the deep sea and holds shares in Loke Marine Minerals.²⁹⁰ According to Reuters, this investment has been criticised by one of their investors, Norway's largest private asset manager Storebrand, whose CEO Jan Erik Saugestad stated that 'We do believe it's not a wise long-term investment'.²⁹¹

Kongsberg is a strategic partner for The Metals Company in developing technology and digital solutions for deep sea mining.²⁹² It is also one of the world's largest providers of Remote Weapon Systems (RWS).²⁹³

What Kongsberg Gruppen says about deep sea mining:

Kongsberg is a company oriented towards producing and developing maritime, aerospace, surveillance and weapons technology. In 2022 it was ranked by the Stockholm International Peace Research Institute as one of the top 100 arms-producing and military services companies in the world (#83).²⁹⁴ As the only Norwegian company making that list, it is also Norway's largest weapons manufacturer. According to a company spokesman, the partnership with Loke is intended to 'form a basis for decisions for sustainable harvesting of seabed minerals'.²⁹⁵

4.7 OTHERS

4.7.1



equinor

Company: Equinor ASA²⁹⁶
Address: Forusbeen 50, 4035 Stavanger
CEO: Anders Opedal

Main Reported Shareholders (Direct and Indirect) in 2023²⁹⁷

Name	Shares held (%)	Reported connections ²⁹⁸
Norwegian Ministry of Trade, Industry and Fisheries	67.00	
Folketrygdfondet	3.57	Manages the Government Pension Fund of Norway ²⁹⁹
JPMorgan Chase Bank (UK)	2.73	
State Street Bank and Trust Co	2.08	
Clearstream Banking SA	1.45	Linked to the Deutsche Börse Group ³⁰⁰

Notes:

During the public consultation on opening Norway's EEZ and continental shelf for deep sea mining, Equinor recommended a precautionary approach and sufficient time to gather knowledge on potential environmental consequences.³⁰¹

4.7.2



Company: Aker BP ASA³⁰²
Address: PO Box 65, 1324 Lysaker
CEO: Karl Johnny Hersvik

Main Reported Shareholders (Direct and Indirect) in 2023³⁰³

Name	Shares held (%)	Reported connections ³⁰⁴
Aker Capital AS	21.16	Main shareholder listed as Kjell Inge Røkke (65.28%)
BP Exploration Operating Company Ltd	15.87	Controlled subsidiary of BP Plc ³⁰⁵
Nemesia SARL	11.58	Controlled by the Lundin Family Trust ³⁰⁶
Folketrygdfondet	5.21	Manages the Government Pension Fund of Norway ³⁰⁷
State Street Bank and Trust Co	3.06	

Notes:

Aker BP has been reported to participate in deep sea exploration projects³⁰⁸ but has not revealed any specific plans for seabed mining. When Norway opened up part of its continental shelf for deep sea mining, the company's CEO issued a neutral statement indicating that it would consider applying for licences and was monitoring the situation.³⁰⁹

4.7.3



Company: TGS ASA³¹⁰
Address: Askekroken 11, 0277 Oslo
10451 Clay Road, Houston, Texas
CEO: Kristian Johansen

Main Reported Shareholders (Direct and Indirect) in 2023³¹¹

Name	Shares held (%)	Reported connections ³¹²
Folketrygdfondet	10.35	Manages the Government Pension Fund of Norway ³¹³
Brown Brothers Harriman (Lux.) Sca	6.68	
Pareto Aksje Norge Verdipapirfond	4.00	
The Bank of New York Mellon (US)	3.87	Largest shareholder listed as The Vanguard Group, Inc. (9.34%) ³¹⁴
State Street Bank and Trust Co	2.99	

Notes:

TGS's primary business is providing energy data and intelligence to companies and investors across energy markets.³¹⁵

5. CONCLUSIONS / DEMANDS



Projection protest in the Sørjord, next to the village Bruvik in Vestland.
© Daniel Müller / Greenpeace

The Norwegian government's decision to open its continental shelf to deep sea mining has been met with almost universal criticism, both domestically, including from its own environmental agency,³¹⁶ and from overseas - for example, by the European Parliament³¹⁷ and the Executive Secretary of IPBES.³¹⁸

Such high levels of opposition call into question the Norwegian government's social licence to go ahead with its deep sea mining plans, which also clearly undermine its international commitments to protect marine biodiversity and sustainably manage its ocean areas. As co-chair of the High Level Panel for a Sustainable Ocean Economy, Norway has a particular responsibility to base its ocean management practices soundly in line with a precautionary approach and the advice of leading ocean scientists.

There also remain legal uncertainties about the strategic environmental impact assessment conducted by the Norwegian government, which makes the government's rush to hand out exploitation licences even more concerning.

A recent survey conducted by Menon Economics on behalf of the Norwegian Offshore Directorate asked the relevant mining companies in Norway about their experience with barriers to them starting mining operations. The companies' responses indicated that 'Despite the opening [for mining], the industry experiences a lack of social acceptance for its work and a need for a "licence to operate". There are clear voices against commercial mining from researchers, companies, environmental organisations and politicians.'³¹⁹ In addition, they report 'severe uncertainties concerning the financial

framework, future profitability and demands regarding environmental assessments'.³²⁰

The companies listed in this report and others considering joining them must take responsibility, and not engage in destructive and potentially illegal activities in the deep sea. This must entail putting all their deep sea mining plans on hold and divesting from all deep sea mining projects.

The Norwegian government is not listening to science, or putting forward a responsible process.

Greenpeace International calls on the the Norwegian government to:

- 1. stop the first licensing round for deep sea mining,**
- 2. halt all funding for exploration activities and development of deep sea mining technologies, and instead**
- 3. support a moratorium on deep sea mining, as more than 30 governments have already done, and**
- 4. refocus its efforts on developing circular measures for resource use and a better understanding of the biodiversity of the deep sea to enable its protection.**

In a climate and nature emergency, now is not the time to open up a new frontier of extraction, but to do all we can to protect the wildlife and ecosystems in Arctic waters.

Children in Bergen, Norway, have their faces painted like sea animals for love of the ocean, and to protest the Norwegian opening for deep sea mining.
© Jenny Marie Baksaas / Greenpeace





Lion's mane jellyfish (*Cyanea capillata*) in the Arctic ocean, near Spitsbergen, Svalbard.

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