



PART 2

Read the text below and answer questions 14–26.

THE DEEP-SEA MINING DILEMMA: RESOURCES VS. ECOLOGY

A

Deep-sea mining refers to the extraction of mineral resources from the seabed, commonly at depths of several kilometres where pressure is extreme and ecosystems function under chronic scarcity. Interest has surged because metals such as nickel, cobalt, copper, and manganese are central to batteries, wind turbines, and other low-carbon technologies. Governments and firms also worry about geopolitical leverage: some high-grade terrestrial deposits are concentrated in a small number of regions, exposing supply chains to instability, export controls, or conflict. Proponents argue that seabed resources could diversify supply and reduce dependence on politically sensitive sources. Critics respond that shifting extraction offshore does not eliminate risk; it relocates it to an environment that is poorly understood and potentially difficult to remediate once disturbed.

B

Among the most frequently discussed targets are polymetallic nodules, potato-sized concretions scattered across vast abyssal plains. These nodules contain concentrated metals, typically bound within layered mineral structures that form around a nucleus over millions of years. On human timescales, this makes them effectively non-renewable. Industrial collection would require vehicles that crawl across the seabed, vacuuming nodules and disturbing the upper sediment layer that has accumulated slowly in the absence of strong currents. Unlike many shallow coastal habitats, the abyss is characterised by low temperatures, low food availability, and slow biological turnover. Many organisms are long-lived and reproduce infrequently, so even a physically “thin” disturbance can translate into long recovery horizons. Because nodules also provide hard substrate in an otherwise soft-sediment environment, removing them can eliminate attachment points that certain specialised species depend on.

C

Ecological concern is not limited to the area directly scraped by machinery. Mining activity can generate turbidity and sediment plume clouds as fine particles are resuspended and transported by currents. These plumes may drift well beyond the mined track, settling on organisms and potentially smothering animals or clogging the feeding structures of filter feeders. Noise and vibration add additional stressors in an environment where some species rely on pressure cues and low-frequency sound to navigate or communicate. Artificial light from vehicles and sensors may also disrupt organisms adapted to near-total



darkness, altering behaviour and predation dynamics. Moreover, processing ships at the surface can create secondary plumes if wastewater or sediment-laden discharge is released back into the ocean. Because deep-sea impacts can be spatially diffuse, defining the true footprint of a project is complex and may depend on local hydrodynamics that are not fully mapped.

D

The economic argument for seabed extraction tends to emphasise urgency. Rapid electrification is expected to expand demand for critical minerals, and expanding terrestrial mining can bring its own environmental and social harms, including deforestation, toxic tailings, and community displacement. Proponents therefore claim deep-sea mining might offer a smaller land footprint and possibly reduce some onshore impacts. However, the business case is constrained by costs and operational uncertainty. Working at extreme depth requires specialised robotics, durable riser systems to lift material, and continuous maintenance in harsh conditions. Energy use is significant, logistics are complex, and the financial model must account for volatile commodity prices. Firms also face reputational and regulatory risk: if projects become associated with irreversible ecological harm, they may lose customers, investors, or permits. In this sense, the economic calculus is inseparable from societal tolerance for ecological uncertainty.

E

Governance is central because many proposed mining areas lie beyond national jurisdiction. In those regions, the International Seabed Authority (ISA), established under the UN Convention on the Law of the Sea, issues exploration contracts and is developing rules for potential commercial extraction. Supporters argue that a formal regulatory body provides a pathway for oversight, standards, and benefit-sharing. Critics counter that the framework remains incomplete and that enforcement capacity is uncertain at the scale implied by industrial operations. They also point to a potential conflict in mandate: encouraging resource development while also protecting the marine environment. As a result, some governments, scientists, and civil society organisations argue for applying the precautionary principle, calling for a moratorium or precautionary pause until stronger safeguards, baseline knowledge, and monitoring systems are in place.

F

Scientific uncertainty is not a peripheral issue but the core of the dilemma. Deep-sea biodiversity is still being catalogued, and many species are known from only a handful of samples, making it difficult to predict how disturbance will propagate through food webs. Baseline studies must capture natural variability—seasonal patterns, episodic food falls, and multi-year shifts—yet such datasets can require years to assemble. Monitoring



recovery is also difficult: sensors must function reliably under high pressure, and ecological change may unfold over decades. These challenges intersect with the debate about need. Alternatives to seabed mining include improved recycling of batteries and electronics, redesigns that reduce reliance on scarce metals, and new battery chemistries that substitute more abundant materials. Yet each alternative has limits. Recycling depends on collection systems and a time lag as products reach end-of-life, while new chemistries must meet stringent safety and performance requirements. As a result, the pace of innovation influences how “urgent” seabed extraction appears, and uncertainty remains on both the ecological and technological sides of the ledger.

G

Public debate increasingly turns on values as well as facts. One view is that mining the deep ocean repeats a familiar historical pattern: exploiting an ecosystem before understanding it, then struggling to restore damage that proves effectively permanent. Another view is that the climate transition requires materials at scale, and that refusing seabed resources may shift extraction pressure onto communities near terrestrial mines, where harms are visible and immediate. Comparing these harms across places and times is inherently difficult under uncertainty, especially when costs and benefits are distributed unevenly between consumers, producers, and distant ecosystems. Consequently, the dilemma is not simply “resources versus ecology,” but how to make decisions when knowledge is incomplete. Many commentators argue that if mining proceeds at all, it should be under robust governance with transparent science, credible monitoring, and cautious thresholds that aim to keep choices reversible. At the same time, investment in demand reduction and circular-economy strategies is presented as a way to ensure the deep sea is not treated as a default solution to resource pressure.

Questions 14–18

Choose **TRUE** if the statement agrees with the information given in the text, choose **FALSE** if the statement contradicts the information, or choose **NOT GIVEN** if there is no information on this.

14 The passage suggests that deep-sea mining is being considered partly because some land-based mineral supplies are geopolitically concentrated.

15 The passage states that polymetallic nodules can regenerate within a few decades after being collected.

16 The passage suggests that sediment plumes created by mining machines may spread beyond the immediate mining site.



17 The passage specifies the maximum distance that sediment plumes can travel from a mined area.

18 The International Seabed Authority issues exploration contracts and is developing rules for possible commercial extraction.

Questions 19–22

Select the correct answer.

19 What does the passage suggest about recovery after disturbance on abyssal plains?

A A physically shallow disturbance allows biological communities to recover quickly.

B Recovery may take a long time because biological turnover is slow and many organisms are long-lived.

C Recovery depends mainly on preventing artificial light from reaching specialised species.

D Removed nodule habitats can be restored once disturbed sediment settles again.

20 Why do some groups support a moratorium or precautionary pause?

A Commercial extraction has been shown to be financially unworkable even with stronger safeguards.

B The ISA lacks authority to regulate mining areas beyond national jurisdiction.

C Existing knowledge, safeguards, and monitoring systems are considered inadequate.

D Environmental risks from terrestrial mining have already been completely eliminated.

21 What does the passage say about alternatives to seabed mining?

A Recycling and new battery technologies may reduce demand, but each faces practical constraints.

B Recycling can meet mineral demand immediately because most relevant products have reached end-of-life.

C Alternative battery chemistries can be adopted without meeting additional safety requirements.

D Their development has little influence on how urgent seabed extraction appears.

22 What does the passage imply about comparing terrestrial and deep-sea mining harms?

A Onshore impacts are easier to reverse because they occur near human communities.

B A single measure can establish which form of extraction causes less overall harm.

C Ecological uncertainty makes any decision about mineral extraction impossible.

D The comparison involves difficult value judgements when knowledge and impacts are unevenly distributed.



Questions 23–26

Complete the sentences below. Choose **NO MORE THAN TWO WORDS** from the text for each answer.

23 Sediment plumes may settle on organisms, potentially or clogging the feeding structures of filter feeders.

24 In areas beyond national jurisdiction, the ISA issues while developing rules for possible commercial extraction.

25 Baseline studies must capture natural, but commercial timelines may pressure decisions.

26 Some experts argue that society should invest in demand reduction and strategies.

Answer Key

14. TRUE

15. FALSE

16. TRUE

17. NOT GIVEN

18. TRUE

19. B

20. C

21. A

22. D

23. smothering animals

24. exploration contracts

25. variability

26. circular-economy