

Deep-sea mining: A dream to come true, or irreversible damage about to hit Coastal-Marine Tourism & Biodiversity and threaten Climate Change Resilience

Industry Study Group
2026

Tourism Sector

Industry
Coastal & Marine Tourism
& Robotics

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Date:
12 - 16 January 2026

Venue:
Wits University



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INTRODUCTION

- Coastal and Marine tourism are affected by deep-sea mining.
- For instance, a study conducted in Fiji found that pristine coral reefs possess a tremendous potential for contributing to tourism and economic development (Folkersen et al., 2018).
- In addition, the study revealed that its tourism economy in Fiji relies heavily on diving and coastal activities.
- Unfortunately, despite the importance of coral reefs to the Fijian tourism sector, the Fijian Government has granted exploration licenses to mining companies to assess the viability of deep-sea mining (DSM).
- Petitions – environmental activists, etc.
- What about South Africa? Blue Economy _ not an exception.
- South Africa lacks a comprehensive legal and governance framework to effectively regulate and manage seabed mining.
- Impacts (SA)
 - i. Seabed mining would negatively impact small-scale fishers who directly depend on healthy marine ecosystems for livelihood and indeed survival.
 - ii. Seabed mining would negatively affect coastal and marine tourism activities.

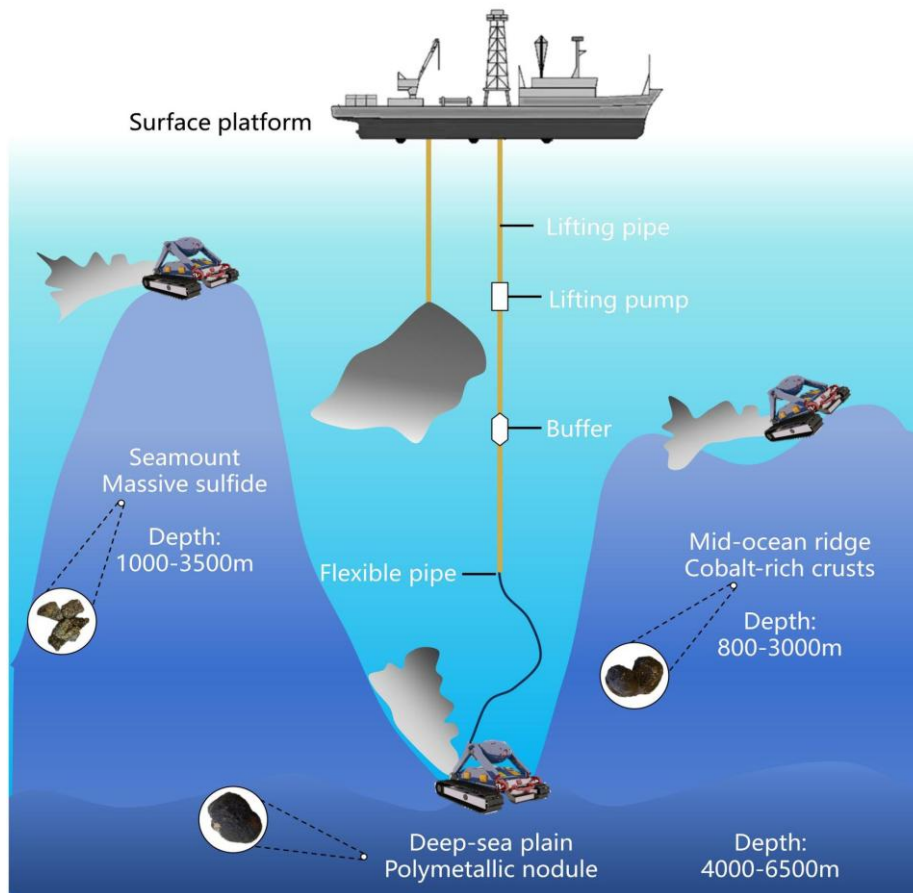
BACKGROUND

- Ma et al. (2022) **define Deep-sea mining** as the utilisation of hydrodynamic or mechanical methods to transport mineral ores from the seabed to the ocean surface and then transport the ores to land-based processing plants by ship (See Figure 1).
- **Fast-advancing technologies** have now granted access to even the deepest parts of the ocean, fuelling interest in commercial exploration of deep-sea resources, such as metals and rare earth elements.
- The **sea or ocean hosts** a unique, largely unexplored biodiversity that is incredibly fragile.
- Deep-sea mining (DSM) activities are currently planned in the economic zones of several national jurisdictions, particularly Pacific Island States, and in areas beyond national jurisdiction (Kaikkonen & van Putten, 2021).
- **The impacts** of deep-sea mining could be irreversible:
 - i. resulting in habitat destruction, species extinction, climate disruption, and disruption of oceanic food chains, as well as an impact on tourism activities.
 - ii. there are still many obstacles to its industrial development activities, which include concerns about environmental pollution and sustainable development issues, etc.

Figure 1: Deep Sea Mining

Schematic diagram of the mining system

Source: Yao et al., 2025.



Minerals at the seabed

Source: Mining & Minerals today, 2025.

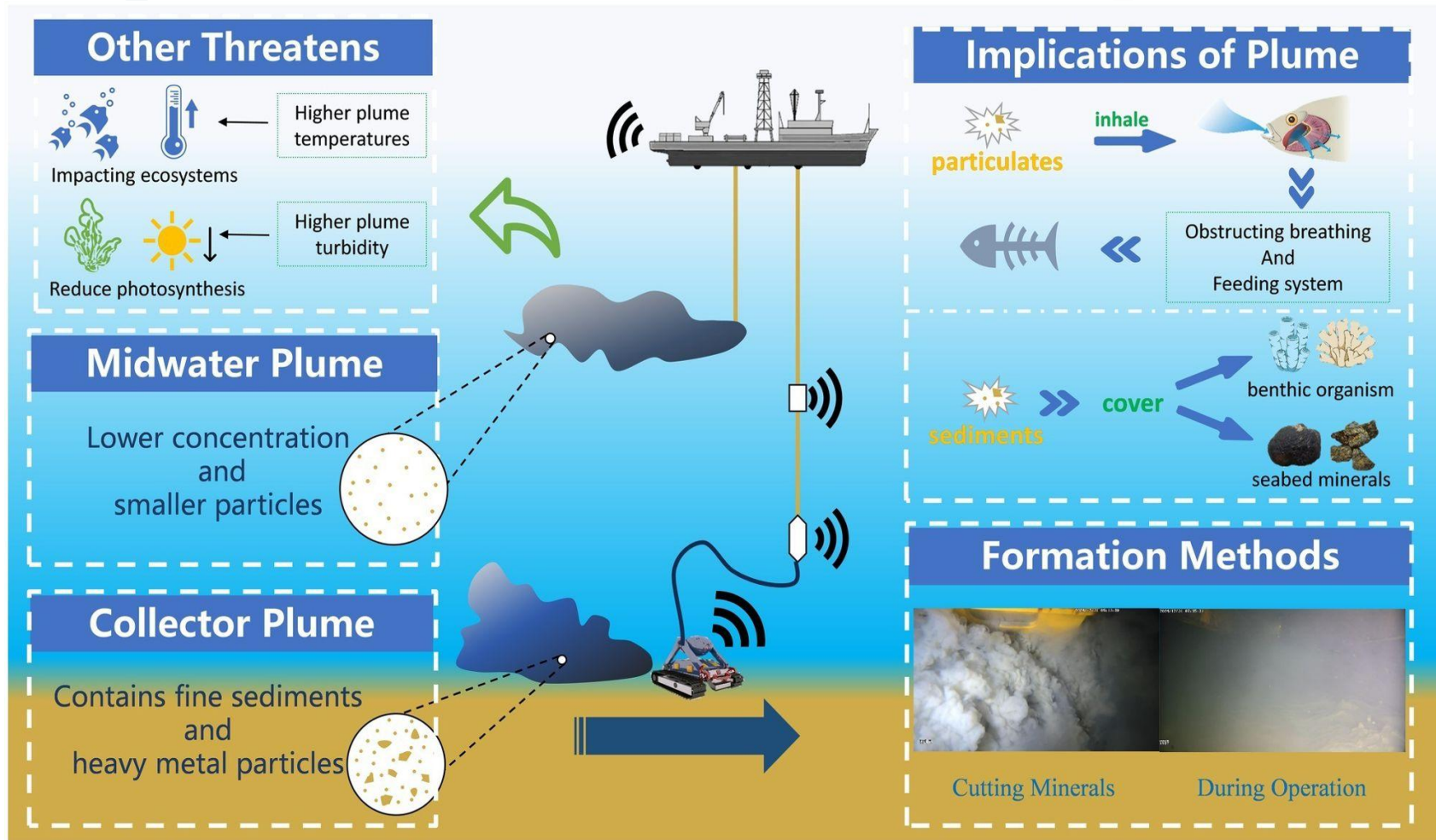


BACKGROUND Cont...

- Additionally, these activities have garnered attention from governments, companies, and scientific research institutions.
- Figure 2 presents the multifaceted impacts of plume generation.
- A **deep-sea plume** is a cloud of fine sediment suspended in the water, primarily caused by human activities like deep-sea mining or natural events like storms.
- These plumes can spread over large areas, reduce water clarity, and potentially smother or poison marine life by burying them or releasing toxic compounds (Problem for tourism activities & biodiversity under the water).

Figure 2: Schematic of plume impacts

Source: Yao et al., 2025



Problem to Investigate

With an understanding that oceans produce approximately 50% of the oxygen we breathe, absorb around 25% of global CO₂ emissions, and capture approximately 90% of the excess heat generated by those emissions (Greenpeace Africa, 2025). This suggests that oceans are our first line of defence against climate change. Destabilising such could lead to a disaster against humanity.

- Currently, there is no guarantee of a sustainable mining system that optimises the conservation of life forms (biodiversity) and tourism activities, including climate change resilience.
- Secondly, there is no assurance that benefits yielded from the blue economy will reach local communities and contribute to genuine sustainable development.

Problem to Investigate Cont.....

Building on the previously presented Figures 1 and 2, this problem seeks to develop:

- i. A mathematical model that supports a sustainable deep-sea mining system or method, which, upon its implementation, could optimise the conservation of life forms and tourism activities and contribute to climate change resilience.
- ii. Mathematical models for the creation and spread of plumes in deep-sea mining (This will assist us to understand the interaction and impacts of the plumes with tourism activities and biodiversity).

ACKNOWLEDGEMENTS

- University of South Africa
- University of the Witwatersrand
- Mathematics in Industry Study Group - SA
- The Hermann Ohlthaver Trust
- Centre of Excellence in Mathematical and Statistical Sciences

Let's advocate for a sustainable Coastal and Marine Tourism, contributing to safe environmental considerations

Thank you for listening!! 😊

