

Baseline data and in-situ experiments to assess environmental impacts in deep sea mining contexts

Pedro Madureira

Department of Geosciences and CREATE research centre, University of Évora, Portugal

Abstract

Despite all commitments made since 2015 and following the Paris agreement on climate change, fossil fuel CO₂ emissions reach a new record in 2024. The impacts on the global Ocean will be active many centuries from now and even after we achieve net zero CO₂ emissions. It is thus expected that changes in Ocean ecosystems and biodiversity will occur despite our conservation efforts.

The Ocean may be a future provider of critical metals that are needed to decarbonize the economy. This work will only refer to the polymetallic nodules, since this type of deep-sea mineral resource have been the focus of the international community (and may be predominant within the maritime jurisdiction of French Polynesia). Polymetallic nodules occur at the abyssal plains, the relatively flat areas of the ocean basins with waters depths over 4,000 m. They occur as mineral concretions with spheroidal or discoidal shapes that mostly lie on top of the sediment layer at the interface with the water column. Apart from manganese, the main metals hosted in nodule minerals include Nickel, Cobalt and Copper.

The most common conceptual view on the technology that will be used to exploit or harvest these nodules is subdivided into three main components: a production vessel at surface, one or more collectors at depth, and a riser that transport these nodules to the production vessel. Current collector systems already at a more advanced stage of development are linked to the same potential impacts to the marine environment: noise, light, and the formation of at least a benthic plume and a potential surface plume depending on the depth that will need to be regulated for dewatering from the production vessel. The questions addressed to these impacts are mostly related with how big the plumes may be and how far they may travel, impacting areas outside the permit. In order to assess the impacts that these activities may have in the marine environment, the characterization of the baseline conditions is crucial and quite demanding. Currently, the documents that have been issued by the International Seabed Authority requires the collection of data on physical and chemical oceanography, the geological properties of the seabed and the characterization of biological communities, both pelagic and benthic, addressing the issues such as population connectivity and ecosystem functioning. This implies the deployment of different types of equipment to collect data from the sea surface to the deep seafloor. Anon et al. (2021) summarizes their opinion on the available environmental baseline and the knowledge on the impacts the harvesting or mining activities may have. However, it is important to address how baseline data can inform on the impacts that may occur from the harvesting activity and here it is argued that more in-situ tests coupled with extensive monitoring are crucial to bring more fundamental knowledge on the impacts on the marine environment.