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Deep sea mineral resources: a true Eldorado? Geological, biological and economic cross-perspectives

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Deep sea minerals (DSM) may be on the verge of a turning point, from the status of a geological resource to that of an economic reserve (according both to the SEC regulation and the ni 43-101 Canadian norm, see http://ccmr-ocrmc.ca/wp-content/uploads/43-101_ni_fr.pdf). Today, this transition notably concerns the potential exploitation of polymetallic nodules in the Clarion-Clipperton Zone.

With a view to a possible exploitation of these nodules, the next step, from an economic and financial point of view, has to be based on the realisation of a pre-feasibility study, announced but not carried out to date. The figure of a profitability of 27% is, however, already announced in several documents provided by The Metals Company (TMC) concerning the NORI Area D Mineral Resource project (Technical Report Summary. Initial Assessment of the NORI Property, Clarion-Clipperton Zone, Deep Green Metals Inc., 17 mars 2021).

However, the move towards industrial exploitation of deepsea minerals has long been announced, but never been enacted, and it is fraught with various forms of uncertainty. These uncertainties concern the elements of geological, biological and economic knowledge, as well as question the desirability / feasability of this exploitation. Uncertainties also includes the status of the entities and actors involved in the DSM arena. For instance, the categorization of corporations like TMC as junior (speculative) or major (industrial) companies remains an open question, as does the relationship between sponsoring states and partner corporations at ISA.

The impacts of the exploitation of DSM on the environment are surely underestimated. The caracterization of the biological components of the ecosystems, including the biological identification and the heterogeneity of the benthic communities and abiotic factors, where the mineral resources are found, but also their relationships with other compartments of the ocean, are very poorly known. Acquiring this knowledge requires further scientific studies, despite international research efforts and APEI (Areas of Particular Environmental Interest) establishments in the CCZ. For example, TMC collected data to study the sedimentary plume generated by a small size pilot nodule collector and concluded that the vertical and lateral extents of this plume are negligible. However, local impacts might still be considerable. In addition, the data that led to this conclusion are not available to the science community for independant validation. Moreover, the impact of the midwater

sedimentary plume generated by the ore process (from the surface vessel) is only fewly documented

Because the geographical distribution of potential deepsea mineral occurences is so large (several tens of thousands of square kms per exploration area) and the available data are so sparse, it is very difficult to assess the lateral extent, continuity and density of nodule fields and Fe-Mn crusts. The spatial heterogeneity is, therefore, likely underestimated and consequently the exploited surface area will be greater than expected and hence the associated impact too.

Here, we present the elements gathered within the framework of the IRD collective assessment on the deep-sea knowledge and governance, and question the representation of the deep seabed as a mineral resource Eldorado.