

SEG 2026 Conference in Salt Lake City, United States

Perspectives on the Potential of Deep-sea Mineral Deposits as a New Frontier for Mining

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Deep-sea mining remains a concept that has yet to become a reality. Manganese nodules from the Clarion Clipperton Zone in the Pacific Ocean are currently the most likely targets for the first commercial mining of the deep seafloor, with predictions for operations to begin in late 2027. Development of seafloor massive sulfide (SMS) deposits continues but remains farther away on the horizon; Co-rich crusts even more so. However, going back almost two decades, predictions of “next year” have become somewhat of a familiar aspirationally consistent annual tradition. That being said, companies are now closer than ever to the first attempts at commercial production. Recent advances include the first ever reported reserve estimates for a deep-sea mineral deposit, field-tested mining vehicles, and, controversially, a shift in the international regulatory environment away from the UN-related International Seabed Authority (ISA) to unilateral permitting in international waters by individual nations, due primarily to delays in the establishment of regulations for mining in international waters by the ISA.

Despite this recent flurry of activity, many fundamental questions remain regarding the viability of deep-sea mining, from a resource, technological, regulatory, environmental, and societal perspective. In this talk, I will provide an update on the state of this nascent industry, covering the questions listed above, but with a focus primarily on recent developments in our understanding of the resource potential for Mn nodules, SMS deposits, Co-rich crusts, and the emerging interest in REE-rich muds.