Potential of deep-sea mineral resources for the blue economy

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The interest in deep-sea mineral resources has surged recently, driven by the increasing need for metals and the global push for sustainable, low-carbon energy sources under the 'blue economy' framework. The deep-sea minerals include polymetallic nodules, cobalt-rich Fe–Mn crusts, and polymetallic sulphides, which contain high amounts of copper, nickel, cobalt and other valuable metals. These mineral deposits are often associated with unique and fragile ecosystems, which necessitates the development of mining technologies with minimal environmental impact. Here, we review the key deep-sea minerals, their resource potential, exploration aspects and the need for sustainable extraction, with a particular focus on India's exploration activities.

Keywords: Blue economy, deep-sea minerals, manganese nodules, mining, sulphides.

their elevated concentration of valuable metals like Cu, Ni, Co, Pt, Ag, Zn and REEs, are essential for manufacturing batteries, renewable energy systems and electric vehicles, thereby playing a crucial role in the development of sustainable technologies and contributing to global transition towards a low-carbon economy[1]. As the world grapples with challenges of climate change and seeks cleaner, greener alternatives, the significance of these minerals becomes even more pronounced.

Exploration and extraction of deep-sea minerals can drive innovation and technological advancements, stimulating economic growth and job creation in the nations actively engaged in these endeavours. Further, access to deep-sea mineral resources and their sustainable extraction ensures a consistent supply of valuable metals necessary for driving the economic growth of developing countries such as India