DEEP SEA MINING: EXPLORATION IS INEVITABLE

Despite concern over adverse impacts, deep marine mineral exploration is set to become a global industry, says geologist

Global demand for metals continues to grow, fuelled largely by increasing populations and the industrialisation and urbanisation of China and India. To meet this demand, the international minerals industry has had to search new areas of the globe for additional resources.

As Africa the last underexplored continent becomes more developed, it is inevitable that the oceans, which cover three-quarters of our planet, will be explored and exploited for their mineral wealth. It is a question of when and how, not if.

Rich deposits

The emergent and submerged volcanic island arcs of the Western Pacific region potentially contain rich deposits of copper, zinc, gold and silver mineralisation. Under the sea, these metals are associated with so-called black smokers volcanic hot springs on the sea floor that belch hot, acidic, metal- and sulphur-rich fluids into the ocean.

These fluids cool rapidly on contact with cold seawater and deposit metal-rich sulphides at, or just beneath, the seabed. The metal content or grade in the resulting seafloor massive sulphide (SMS) deposits is often at least ten times higher than that of similar deposits on land, particularly for copper and gold.

The economic viability of deep marine mining hinges on the high value of the SMS ores, even though current technological limitations mean that mining can occur only at or just below the seabed (on land, mining can occur up to a kilometre or more below the surface). Every tonne of ore mined will produce significantly more metal than a terrestrial deposit and very little, or no, waste material.

Additionally, in contrast to the land, there is no need to build infrastructure such as roads, rail and port facilities. SMS mining operations will therefore be low footprint in terms of overall environmental impact, compared with land operations.

This makes SMS ores highly valuable and economically attractive to mineral explorers willing to take the plunge.

Potential wealth

Many island nations of the Western Pacific have limited land areas with scarce mineral resources, but they do have enormous maritime territories with largely

unexplored mineral potential. And so the economic attraction of the nascent deep sea mining industry to these countries is obvious.

West Pacific governments, such as that of Papua New Guinea (PNG), are keen to encourage potential seafloor miners to explore their waters, with the hope that success will bring wealth (through stockpiling ore for export and royalty payments, for example) and employment opportunities for their people although these are likely to be minimal.

It is estimated by the industry that more than one million square kilometres of seafloor in the Asia-Pacific Region is under exploration licence. However, exploration does not always lead to mining. On land, around one in 100 exploration projects results in a mine, but the deep ocean industry is too young to provide any statistics.

No ore has been mined yet, but Nautilus Minerals, a Canadian-listed, Australia-based company, has approval to mine high-grade copper-gold ore from the Solwara 1 SMS deposit located between the PNG islands of New Britain and New Ireland, at a water depth of approximately 1.6 km.

The company also has more than half a million square kilometres of seafloor in Fiji, New Zealand, PNG and Tonga either under exploration or pending licence approval.

The start date for mining of Solwara 1is uncertain, as Nautilus is currently in dispute with the PNG government, which is a co-investor in the venture, over payments towards the project.

Unknown impacts

Opponents of deep marine mining point to ecological, environmental and social concerns, including disruption to existing marine industries, such as fishing; potential pollution of ocean waters with metal-rich slurries; and direct destruction of the unique biological communities that flourish around active black-smoker vent sites.

However, surface sampling and drilling activities have stimulated renewed hydrothermal venting, and artificial vents have attracted vent fauna. So it is likely that by disturbing the seabed beneath SMS mineralisation, dormant vent fields may be reinvigorated, leading to renewed ore body formation and the reappearance of the biological communities that thrive on vent activity.

In addition, rapid rates of growth imply that profitably mineable SMS resources can form within years to decades, opening up the intriguing possibility of treating SMS deposits as a renewable resource. Small structures a couple of centimetres in diameter and tens of centimetres in length have been observed to form within minutes; larger, tree-like structures are known to grow tens of metres (and tonnes of sulphide) a year.

But there are still many unresolved questions regarding the social and environmental impact, as well as the acceptability of deep marine mining: questions that require ongoing geological, biological and social research.

Social research by organisations such as the Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australias national science agency, consistently shows that the general public is concerned about the potential impact of seabed mining and that they would like to see more information gathered before the launch of the industry.

Working at sea is costly and, perhaps ironically, the funding and access provided by mineral explorers can help in carrying out thorough studies. To date, the industry has been willing to engage the worlds leading researchers in vent geology and ecology as it develops.

As Nautilus develops Solwara 1,the mineral industry will be watching closely. Success for Nautilus will signal that marine mining, currently a small niche in global mineral exploration, has the potential to be a major global industry, with the Western Pacific at the forefront.

Source: http://www.scidev.net/global/earth-science/opinion/deep-sea-mining-exploration-is-inevitable.html