



4. Offshore mineral exploration

4.1 Background

Seafloor mining was pioneered in the 1970s, primarily to access manganese nodules and the nickel, copper and cobalt they contain (McDonald, 2005). The mining of offshore phosphate nodules subsequently followed throughout the 1980s. Despite these activities, there is limited information available regarding offshore minerals. Available data has primarily been obtained by private companies and through reconnaissance surveys undertaken by federal and state geoscience agencies (McKay *et al*, 2005). The main focus of these explorations and mining activities to date has been extraction of construction material, heavy mineral sands, and high value placer deposits of gold and diamonds (McKay *et al*, 2005). Other minerals potentially available for extraction from the sea bed include sulphide rich in copper, gold and zinc located around hydrothermal vents, carbonate sands and phosphate and manganese nodules. Many of these minerals are located offshore in Commonwealth waters including the East Marine Planning Region (greater than 3 nautical miles from the coastline), although minerals may also be located in the nearshore environment within State waters.

Two major offshore extraction operations currently take place in Australian waters. These include sand dredging in Moreton Bay, Queensland and lime-sand dredging off Fremantle, Western Australia (McKay *et al*, 2005). Only a handful of minerals exploration licences (MELs) are in existence. This is in stark contrast to the 40,000 onshore documented mineral occurrences, highlighting the potential that may exist within Australia's marine environment (McConachy *et al*, 2005).

Applications for Mineral Exploration Licences (MELs) can be made in accordance with the Offshore Minerals Act (1994). The initial MEL lasts for four years (Geoscience Australia, 2006). Between 1990 to May 2006, 74 offshore MEL applications were submitted throughout Australia, however, there are currently only two (2) active MELs. They are for exploration off Tasmania and Western Australia (Geoscience Australia, 2006).

4.2 Regional activity

No major offshore mining or exploration operations currently take place within the East Marine Planning Region, although many minerals within the Region have been identified and show promise for future offshore mining. A major sand dredging operation does exist in adjacent State waters off Brisbane.

There are currently no active Mineral Exploration Licences within the East Marine Planning Region. However there is potential for sand mining in both the nearshore and offshore zone, particularly within state waters adjacent to the East Marine Planning Region.



Nearshore Minerals

Sand from sand mining or extraction is largely used for beach nourishment and construction (lime, cement) purposes. Traditionally, sand for construction purposes has been derived from terrestrial sources. However, exhaustion of these resources led to identification of alternative sources including marine sand. Nearshore sources have been utilised due to their proximity and accessibility as opposed to offshore sources. However, many of Australia's nearshore sand mining operations have ceased over the past few decades due to an increase in environmental concerns and exhaustion of resources. For example, a mining operation for shell sand (primarily calcium carbonate) off Cockburn, Western Australia has been relocated due to concerns about the seagrass within the area, whilst Brisbane's lime sand operation has ceased (McKay *et al*, 2005).

Recent interest in nearshore sand/carbonate mining is largely focussed around the Sydney region in State waters adjacent to the East Marine Planning Region, although offshore sand is also known to occur from The Entrance in New South Wales to Rockhampton, Queensland (Salt, 2001).

Other nearshore minerals that occur in State waters adjacent to the East Marine Planning Region include:

- Mineral sands (rutile, zircon, ilmenite, monazite) off southern Queensland and central and northern New South Wales coasts (McKay *et al*, 2005); and
- Offshore extensions from onshore deposits such as coal off Newcastle, New South Wales have been mined from shore using underground methods from onshore (McKay *et al*, 2005).

Offshore Minerals

Sand mining is considered a viable offshore mining option in Commonwealth waters offshore of New South Wales. With sand resources known to exist in Commonwealth waters between Wollongong and Newcastle, a number of companies have applied for marine aggregate (sand) exploration licences to extract the sand (Geoscience Australia, 2007). These include Metro Mix Pty Ltd and Sydney Marine Sand Pty Ltd. Unsuccessful with their first application, Sydney Marine Sand Pty Ltd submitted another application in August 2006 for the exploration of 180km² of seabed approximately 5.5km off the New South Wales central coast. The outcome is not yet known.

Other potential mineral resources within the East Marine Planning Region include:

- Base and precious metals on Lord Howe Rise (McConachy *et al*, 2006).
- Manganese nodules off the New South Wales and Queensland coasts (Salt, 2001).
- Phosphorites off the northern New South Wales coast, on continental margins and seamounts (Geoscience Australia, 2007; Salt, 2001).

Sulfides associated with hydrothermal vents are located around mid ocean ridges and therefore none are likely to occur in Australian waters.



4.3 Economic context

Offshore mineral exploration expenditure in Commonwealth waters in the past has only amounted to \$17 million, significantly less than the \$800 million expenditure involved in onshore exploration (McConachy *et al*, 2006).

Due to the difficulty and expense of offshore mining, the feasibility of seafloor mining depends largely on the discovery of minerals with a high value per tonne. Although diamonds, other gemstones and minerals such as gold are mined from the seafloor within other marine regions, to date only phosphorite and manganese nodules have been discovered within the East Marine Planning Region. Phosphorites nodules found off northern New South Wales are thin and low grade, thereby limiting their economic potential (Geoscience Australia, 2007). In the past, the cost of extracting and treating the resources has outweighed their commercial value but this may change as new technologies are researched and developed. In fact, minerals obtained from hydrothermal fields have shown to have economic prospects equal to or even higher than terrestrial mines (McDonald, 2005).

There is a high demand for lime in the mineral processing industry with the majority sourced from Western Australia. However, this means that lime prices in the Eastern States tend to be higher due to the smaller production volumes (Hegge *et al*, 2005).

4.4 Impacts on the environment

As most sand extraction occurs in nearshore regions, environmental concerns are those that may not directly impact the East Marine Planning Region. However, an example of the concerns include impacts to benthic flora and fauna, disruptions to migratory marine mammals, the risk of vessel collisions and increased suspended sediments (Hegge *et al*, 2005; EPA & DSDI, 2005). Sensitive environments are often at risk, including seagrass beds and coral communities. Coastal impacts from sand mining have also been raised and include changes to the nesting behaviour of turtles, shorebirds and other nesting species, adverse impacts to invertebrates and changes to coastal processes.

The impacts of offshore manganese and phosphorite mining are not well understood due to the limited nature of offshore mining at the present time. However, environmental impacts associated with nearshore mining, such as vessel collisions, suspended sediments and disruption to fauna, are also relevant to offshore mining.

4.5 Future uses

Nearshore Mining

The demand for carbonate sands for the construction industry is high and growing, especially as terrestrial sources diminish. Existing land-based licence operations are unlikely to meet future demand while new operations face opposition due to the environmental impacts. Annual



consumption of construction sand in Sydney was 6-6.5 million tonnes (Mt) in 2000 and is expected to keep rising to reach approximately 6.6 Mt by 2020 (Hudson, 2005). South-east Queensland relies heavily on its offshore sand extraction within Moreton Bay and the Government has approved further extraction over the next 15 years. As demand increases further and current resources diminish, the opportunities for sand extraction in Commonwealth waters may be realised.

Offshore Mining

Interest in mining of the seafloor is likely to increase as exploration and technological advances progress the accessibility and economic feasibility of seafloor minerals. In addition, as terrestrial resources diminish, there will be a greater need to source minerals from offshore sources. While the cost of offshore mining has been a concern in the past, future increases in production will reduce unit operating costs (McDonald, 2005).

Although the future of deep sea manganese mining is uncertain, increased demand and a reduction in available terrestrial resources may see the development of nodule mining offshore by 2020 (Glasby, 2002). However, the feasibility of nodule mining in Australia will depend on the mineral content of the nodule and their value per tonne.

4.6 Information gaps

Despite the potential mineral resources in the Region, little is known about the actual presence of minerals. Further exploration and mining of resources has not occurred primarily due to the limited information about the resources and the difficulty and expense in procuring the minerals.

Therefore, additional scientific research is required into the feasibility of offshore seafloor mining in Commonwealth waters within the East Marine Planning Region. Knowledge gaps remain about known and unknown offshore minerals, their locations and their potential economic contribution (McKay *et al*, 2005).

Additional data must also be collected on the environmental impacts that may be associated with offshore mining if this is to become a growing industry within Australia. This is especially true because of the high biodiversity within the ocean and the recovery time of disturbed communities, which is considered slower than in shallower waters (Ahnert & Borowski, 2000).

The limited number of described species and the restricted knowledge of their distribution add to the difficulty in predicting impacts of sea floor mining (Ahnert & Borowski, 2000).

4.7 References

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