ENVIRONMENTAL IMPACTS AND MANAGEMENT OF COAST

♦ Deep Sea Mining and Oil Exploration:

Deep sea mining is a mineral retrieval process that takes place on the ocean floor. Ocean mining sites are usually around large areas of polymetallic nodules or active and extinct hydrothermal vents at 1,400 to 3,700 metres (4,600 to 12,100 ft) below the ocean's surface. The vents create globular or massive sulfide deposits, which contain valuable metals such as silver, gold, copper, manganese, cobalt, and zinc. The deposits are mined using either hydraulic pumps or bucket systems that take ore to the surface to be processed. s with all mining operations, deep sea mining raises questions about its potential environmental impact. Environmental advocacy groups such as Greenpeace and the Deep Sea Mining Campaign have argued that seabed mining should not be permitted in most of the world's oceans because of the potential for damage to deep sea ecosystems and pollution by heavy metal laden plumes.

➔ Environmental impacts of Deep Sea Mining and Oil Exploration –

- Over Exploitation – Extraction of sea based minerals like oil, manganese, cobalt etc increase in an extensive scale to meet the global demand. High speed of urbanization, globalization and industrialization and increasing of population built up the pressure on natural resources. That is why over exploitation started and concept of sustainable development comes under a question mark.
- Water Contamination – During the mining process carried out under water, sometimes different toxic minerals like Seafloor Massive Sulphides (SMS), ferromanganese nodules, or cobalt-rich crusts may release toxic concentrations of metal ions into the environment at distinct phases of the mining cycle. It causes massive changes in properties of ocean water and brings negative impacts on aquatic ecosystem.
- Impact on Landscape – To perform of deep sea mining several infrastructures have to make. Due to those constructions huge number of natural landforms like cliff, escarpments of coastal areas, coral reefs of continental shelf areas as well as landforms like guyot, ridge of deep sea bed get destroyed. Beside those constructional works movements of ships and other vehicles also do a lot of damages.
- Aquatic Ecosystem – In deep-sea mining, a collector vehicle would be deployed from a ship. The collector vehicle then travels 15,000 feet down to the seabed, where it vacuums up the top four inches of the seabed. This process creates a plume known as a collector plume. As the collector moves across the seabed floor, it stirs up sediment and creates a sediment cloud, or plume, that's carried away and distributed by ocean currents, turbidity in the water column and addition of bottom sediments in the water resulting in change in the marine ecosystem.
- Loss of Biodiversity – Negative impacts on aquatic ecosystem can put a question mark on the existence of a particular species. So, increasing rate of water pollution, oil spilling etc make the path wider for loss of biodiversity. Beside this due to destruction of natural landforms several species lost their natural habitats also.

➔ Management of Deep Sea Mining and Oil Exploration –

An Environmental Management Plan can be defined as 'The synthesis of all proposed mitigation and monitoring actions, set to a timeline with specific responsibility assigned and follow-up actions defined. The EMP is one of the most important outputs of the environmental assessment process' (World Bank 1999). It can also be defined as '.... a tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented; and that the positive benefits of the project are enhanced' (Lochner 2005).

Very often Environmental Management Plan (EMP) and Environment Impact Assessment (EIA) are used interchangeably. An EIA is a process of assessing and analysing the potential or actual environmental impacts (positive or negative) of a project. The output of this process is an EIA report which normally should culminate into an EMP. Hence, an EMP is essentially an action plan based on the results of the EIA study that would spell-out specific strategies to minimize the negative impacts. Environmental management plans are thus an outcome of a thorough environmental assessment process of any development activity. 17 Development of Environmental Management Plan for Deep-Sea Mining 494 There is a need, therefore, for environmental management actions to be properly addressed in EMPs and thereby improve the effectiveness of EIA (University of Manchester 2003).

The objectives of an EMP should include (World Bank 1999; Hill 2000):

- Ensuring compliance with regulatory authority stipulations and guidelines which may be local, provincial, national, and/or international;
- Ensuring that there is sufficient allocation of resources on the project budget so that the scale of EMP-related activities is consistent with the significance of project impacts;
- Outlining the mitigation measures for the anticipated negative impacts of the proposed activity
- Verifying environmental performance by monitoring the information on impacts as they occur;
- Responding to changes in project implementation not considered in the EIA;
- Responding to unforeseen events;
- Providing feedback for continual improvement in environmental performance.

Hence, an EMP would flow from the EIA and should continue throughout the life of the project. The format for an EMP and its contents would vary with the purpose for which it is being designed and the scale of the project. Another important feature of the EMP is that it should be dynamic. As the project gets into the operational stage, major impacts occur and as the processes keep changing, the impacts vary. Thus, a periodic review of the management plan is required. The extent to which EMPs should be reviewed and updated varies between and within sectors (World Bank 1999). Institutional arrangements should be made such that the implementation and review of the plan is built into the functioning of the system.

➔ **Measures for Developing environmentally 'Safe' Mining System –**

Deep-sea mining is still in its developmental stages; hence the best environment management practices can be incorporated into the design, technology, scheduling, and monitoring of the activity. Some of the fundamental considerations to keep the impacts to a minimum level have been enlisted by ISA (2001) and are as under:

1. Minimize sediment penetration of collector and mining vehicle
2. Avoid disturbance of the more consolidated suboxic sediment layer
3. Reduce mass of sediment swirled up into the bottom near-water layer
4. Induce high rate of re-sedimentation from the plume behind the miner
5. Minimize the transport of sediment and abraded nodule fines to the ocean surface
6. Reduce the discharge of tailings into the bathyal or abyssal depth
7. Reduce the drift of tailings by increasing their sedimentation

♦ **Salt Manufacturing:**

➔ **Impacts –**

Environmental impact rock salt mining by dissolution manifests in various ways:

- Surface and ground waters may be affected by discharges of contaminated water,
- Air can be affected by emissions of particulate matter,
- Subsidence of surrounding terrain can affect inhabited areas.
- Moreover, when it is not accurately known the deposit's tectonic and of surrounding rocks, the underground gaps remaining after the extraction of salt can propagate up to the surface, which may have as a result of uncontrolled outflow brine.
- When hydrocarbons are used to achieve the protection blanket, the discharge may cause environmental contamination.

To avoid such catastrophic events occurrences is important to know the characteristics of salt for proper sizing of safety pillars aimed at salt cavities stability provision. This paper presents possibilities of minimising the environmental impact from the solution salt mining processes.

➔ **Management Processes –**

- When considering working methods that are consistent with minimisation of water ingress and disturbance, it is important to distinguish between surface and underground mine applications. Although the principles used are similar in both cases, the details of the techniques differ markedly.
- Furthermore, it is also important to define the time scale over which the intended preventative measures are expected to be effective. Obviously, measures and actions that are appropriate for extractive operations may not have significant benefits for the post-closure phase of the mine life cycle.
- Rehabilitation activities generally involve the design and creation of stable and safe landforms, followed by the establishment of self-sustaining ecosystems to replace those disturbed during the mining process.

The effectiveness of rehabilitation is enhanced by integration with the mine plan and conducting it progressively throughout the life of the mine.

- Rehabilitation involves a sequence of activities such as: topsoil removal and placement; landscaping of disturbed areas; re-vegetation and reestablishment of the nutrient cycle; maintenance of rehabilitated areas; monitoring and determination of rehabilitation success.

♦ **Land Reclamation:**

Land reclamation is the process of artificially creating new land. This is done either by draining out muddy areas or by filling up existing water bodies such as oceans, seas and riverbeds. The new land created as a result of this is called reclaimed land, reclaimed ground or landfill.

The purpose of land reclamation is to create new land for housing, agriculture and industry. Reclaimed land is most commonly found in coastal cities to increase housing capacity and build ports. In more arid regions, unusable land is reclaimed to promote local agriculture and improve irrigation.

➔ **Methods of Land Reclamation –** The method employed for land reclamation differs depending on the surrounding topography, resource availability and local law.

- Infilling: Infilling is the most commonly used method of land reclamation. It involves filling the reclaimed area with large quantities of dry rock and soil.
- Land Dredging: In this method, sediments and debris are removed from the water bed to remove the natural sedimentation that occurs and accumulates over time in artificially created harbors.
- Draining: Artificial draining is a method that is commonplace when reclaiming land from submerged wetlands. This is usually done for agricultural purposes because the soil is nutrient-rich and fertile. In the Netherlands, the process of pumping water out of marshes is known as pondering.
- Reclamation of arid land by irrigation: To reclaim land in arid and semi-arid regions, pumping systems are set up to bring water to the dry land to make it more fertile. This is usually done for agriculture and examples of this can be found in the deserts of the Middle East and the Columbia Basin.

Examples – The business district of Cebu City in the Philippines, most of the coastline of the bustling Indian city of Mumbai, the Barceloneta area in Barcelona, Spain and Battery Park City in Manhattan, New York are all prominent examples of reclaimed land.

What we know today as the city of Mumbai, was formerly a group of seven islands that by 1845 has been fused into one giant landmass by the process of land reclamation.

The city of Dubai in the UAE has several examples of modern-day land reclamation projects. The Palm Islands comprise three artificial islands built on reclaimed land - Palm Jumeirah, Deira Island and Palm Jebel Ali. The construction of these islands was extremely resource-intensive and drew criticism from several environmental agencies for being destructive to the surrounding coral ecosystem.

In Singapore**,** the first land reclamation project was carried out in 1822. Singapore's small size and geographical bounds pose a limit to expansion. Through the 19th century, and even to this day, the only possible alternative to supporting the increasing Singaporean population has been to reclaim land from the sea.

➔ Impacts –

- Land reclamation needs to be done carefully. If projects aren't managed diligently, the result could be long-term problems such as building subsidence and greater flood risks. Land reclamation projects also need to take into account any impact on the local and wider environment.
- The processes of land reclamation can cause long and short-term problems which are harmful to habitats. There is an obvious change where the land is created, but habitats can be disturbed or destroyed in the process of gathering the earth or dredging for materials to add to the land.
- Construction work causes short-term disruptions, but the mud it causes can affect water clarity, making it difficult for plants and creatures to survive. The machinery used to carry out the work can also introduce pollutants to the area.
- The work can also change the shape of the seabed and wave patterns, in turn changing tidal patterns, leading to changes in the ecosystem. It can change the natural coastline and alters the waterbed.

- Aside from the creation of new land, there also is the question of where the fill material is sourced from. Gathering the rocks and the soil to fill up the target area could mean the destruction of existing landmasses.
- If not done carefully, land reclamation can lead to long-term problems such as soil erosion and increase the risk of floods.
- Alongside long-term issues, there can be some short-term disruptions such as negative impacts on the air and water quality which can make it difficult for flora and fauna to survive.
- Despite the obvious negative impacts that land reclamation can have on the environment, many countries continue to expand along the coast as well as inland to add more area to their territories. In 2000, 17% of the land in the Netherlands was reclaimed and this number has only grown since. Macau has increased its size by almost 200% by building on reclaimed land, and in Singapore, the number stands at around 20% of the initial area of the tiny country. Further projects have been planned to increase the size even further.

➔ **Management Processes –**

- Before any coastal reclamation is undertaken, the status of the area with respect to Aboriginal land claims and native title claims must be clarified. Even in the absence of a specific native title claim over an area, there may be native title implications. If the area is subject to either an Aboriginal land or a native title claim, certain procedures must be followed before reclamation is undertaken. These procedures will vary according to the nature of the claim.
- The planning requirements for a project depend on the area in which the development is to occur. All foreshore filling in areas covered by the Darwin Town Plan 1992 (as amended), for example, requires consent from the Development Consent Authority. All development covered by the East Arm Control Plan requires Ministerial consent. Development Assessment Services, Department of Planning and Infrastructure can provide more information regarding planning requirements.
- A number of environmental and heritage issues must be considered prior to undertaking any reclamation.
- Before commencing reclamation activities, an environmental management plan should be prepared. The plan should consider the purpose of the reclamation, the physical constraints of the site (such as storm surge, reclamation extent, erosion and siltation) and significant natural or cultural features. Potential acid sulfate soils should be identified at this stage. Consideration of these issues during the design stage will have long term environmental and economic benefits, whereas mitigation of problems after they have arisen is often time consuming and costly.
- Development that requires direct access to the sea should be designed to ensure that only the minimum required amount of reclamation is undertaken. This can be achieved by confining most site development to above the intertidal zone and retaining as much of the natural land/sea interface as possible.
- Reclamation in coastal areas can affect the local hydrodynamics (water movement) and lead to erosion or siltation in unexpected areas. The Natural Resource Management of the Department of Natural Resources, Environment and The Arts should be contacted early in the planning stage for advice in this area.

♦ **Tourism:**

➔ **Impacts –**

- Degradation and loss of natural ecosystem and aesthetic landscape – Improper development of infrastructures such as extensive paving and sand and beach mining, unplanned construction of resorts, hotels, roads, airports, power plants, reservoirs, and waste disposal systems brought about as a result of tourist visits has led to congestion within areas that are fragile and sensitive like natural habitats for wildlife, wetlands, coral reefs, lakes, forests, minerals, oceans, fertile soils, and riverbed basins.
- Various types of environmental pollution – Tourisms as a whole and some of the actions by tourists have over time adversely affected the destination areas through various kinds of environmental pollution including air, land, water, and soil. Some tourists, for example, will litter and leave behind garbage or waste like plastic wrappers and cigarette butts in the surrounding environment thereby causing land

pollution, plastic pollution, and cigarette pollution respectively. Water pollution due to recreational boating activities has equally been reported. Tourism is also highly associated with noise pollution during festive seasons and events, and particularly due to high noise levels from cars, buses, airplanes, and recreational vehicles that can cause distress to wildlife and even alter wildlife's natural activity patterns.

- Depletion of natural resources – When the number of tourists visiting an area over time surpasses the level to which the area can sustain; it subsequently leads to an overuse of the available local resources causing a strain to the environment. In most cases, tourism puts a strain on the already scarce local natural resources owing to over-consumption.
- Depletion of social and cultural norms – International tourists come with diverse social-cultural behaviors that are often quite distinct with the usual ways of local dwellers. Tourism involves intermingling and exposure to new experiences, new practices, a dynamic way of living, new traditions, and new historical background for the locals.
- A contributor to global warming and climate change – Tourism is a key contributor to greenhouse gases emitted in the atmosphere, which have been scientifically proven to be the main reason for the increasing global temperatures and changing climates. This is simply because tourism entails the movement of people from their areas of residence to new destinations.

➔ **Management Processes –**

- Awareness creation and sensitization about sustainable tourism – Overtime, tourism has brought about awareness in conservation, protection, and maintenance of exotic often near-extinct, fragile flora and fauna in the ecosystem.
- Implementaion of Organisations and programmes – Organizations such as The World Wildlife Fund, UN Environment Programme, and the Nature Conservancy have set strategies, policies as well as programs that steer ahead of the agenda of sustainable tourism. International and local tourists, as well as dwellers, are also becoming more and more aware of the value of preserving and maintaining the environment.
- Adoptation of regulatory measures – Through enacting regulatory measures to curb the potential negative aspects of tourism, the government has been able to offset a number of destructive environmental impacts. Such measures include the control of the visiting number of tourists, identifying and limiting accessibility within protected areas, and setting up restrictive legislation directed at conserving the environment like carbon offset programs. With these policies upheld, it has become easier to uphold the vitality and the integrity of tourist sites and the protection of surrounding natural resources as well as ecosystems.
- Development of Infrastructure – Improvement of roads, electrical grid systems, telecommunications as well as social amenities are some of the benefits that have been realized around communities within tourist destination sites. This brings about the improvement of standards of living, especially in remote areas; as well as improving on the landscape and aesthetic nature of an area.
- Preservation of historic monuments and cultural heritage – Some international tourists seek to experience diversity in culture and a difference in the scenery as compared to theirs. This need brings about demand from the local dwellers to retain their culture as well as preserve their historical monuments as it becomes a tourist attraction. Some of their cultural practices that have not been eroded by modern civilization link to the natural habitat of the area. Practices such as using herbs for medication, or linking certain wild animals with historical significance helps retain and preserve their ecosystem. Despite the benefits that come with tourism as the fast-growing industry globally, it has left behind numerous poorly managed and uncontrolled negative impacts on the environment that warrants the need for ecotourism or sustainable tourism options.