At the new millennium, utilization of marine minerals is accelerating and knowledge of new types of marine mineral resources is expanding with significant present and potential scientific and economic benefits. The utilization of marine minerals is driven by growing societal and industrial needs, which may be met by turning to the sea for materials that are in short supply, strategically vulnerable, environmentally sensitive to recover on land, or can be recovered more economically from the seafloor. So a clear concept about the variety of minerals obtained from different marine regimes, their extraction, utility and the overall impact on environment has been concise in this chapter.

Ocean covers about 70.2% of the Earth’s total surface area. It is home to a large variety of minerals, which are essential for supporting the existence of the living world in many aspects. With the rapid progress of industrialization, the land mineral resources are getting exhausted and the underwater mineral resources have become a serious matter of concern nowadays. Marine minerals are distributed in a vast array of environments, starting from the coastal belt up to the deeper part of the ocean. The chief tool for underwater mineral exploration is seismic and magnetic profiling, dredging and coring tools, depth sounding, laboratory analyses, and geological and bathymetric mapping. At the present, less than 5% of the coastal seafloor of the world has been scientifically surveyed. In the search of the deep sea for minerals, if all of the dredge samples taken to date were averaged over the deep sea floor, this would give three dredge hauls per million square kilometres.

11.1 MARINE ENVIRONMENT

Geochemistry of Sea Water

Ocean water is naturally alkaline and its bicarbonate buffering results in a
normal pH of 8.0-8.3. Metal bicarbonates such as magnesium bicarbonate and calcium bicarbonate will only form in the natural aqueous, alkaline state of the ocean. These mineral combinations do not occur in solid or dry form. The complex mixture of minerals and liquid that make up sea water consists of 96.5 per cent water, 3.4 per cent salts, and smaller amounts of other substances including dissolved inorganic and organic materials, particulates, and a few atmospheric gases. It is the various salts that give sea water its taste. Salt is a chemical compound of elemental atoms that act as molecules and ions when in solution. Eighty-four of the Earth’s basic elements have been identified in sea water as either macro or trace mineral ions. The complex mixture of macro and trace elements found in sea water, result from the interaction of natural forces over millions of years.

**Physiography of the Sea Floor**

To understand the mineral potential of the marine environment, it is important to understand the physiography of the sea floor.

Some of the dominant topographic features associated with the ocean basins include:

**Continental shelf** is a shallow (average depth 130 metres) gently sloping part of the **continental crust** that borders the continents. The extent of this feature varies from tens of metres to a maximum width of about 1300 kilometres.

The **continental slope** extends from the continental shelf at an average depth of about 135 metres. The base of this steeply sloping (from 1 to 25°, average about 4°) topographic feature occurs at a depth of approximately 2000 metres, marking the edge of the continents. The width of the slope varies from 20 to 100 kilometres. Both the continental shelf and slope are considered structurally part of the continents, even though they are below the sea surface. The boundary between the continental slope and shelf is called the continental shelf break.

**Submarine canyons** are V-shaped canyons cut into the continental slope to a depth of up to 1200 metres. The submarine canyons are cut perpendicular to the running direction of the continental slope.