

6. Ocean Resources



Use your brain power!

Collect information of the following and discuss in the class :

- Major journeys carried out by explorers in the last millennium
- Discovery of continents, countries and islands
- Spread of culture, trade and religions

Comment on how oceans have played a major role in all the three points mentioned above.

Geographical explanation

During discussion, you must have realised that in the early fifteenth century, only a small part of the whole world was known. Later on, besides Europeans, navigators from other parts of the world also sailed around the world and collected information about new lands. The scientific study of oceans began in the early nineteenth century. In this period an important voyage of discovery took place between 1872 and 1876 when the British ship 'Challenger' sailed around the world. It brought new information about the ocean depths and teeming life found in them. In 1920s, the Echo sounder came into regular use. With the help of this technique, the map makers began to map

different ocean floors. Today, many nations are involved in the study of the oceans.



Do you know?



The Echo Sounder is a type of SONAR (Sound Navigation and Ranging) device. It is used determining the depth of the sea bed or detecting objects

in deep water by measuring the time taken for sound echoes to travel.



Try this.

Look at figure 6.1 and answer the following question.

- 1) What does the figure show?
- 2) In which part of the figure is the ocean shallow? Which human activities can be carried out here?
- 3) In which part does deposition of sediments occur?
- 4) Where in the figure do you find islands formed due to submerged mountains?
- 5) Label the figure with correct names of landforms.
- 6) Compare these features with the landforms on the earth.

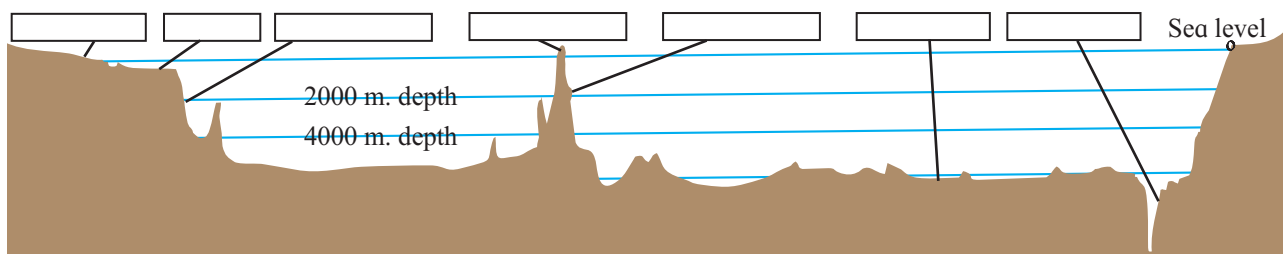


Fig. 6.1 : Ocean floor

Geographical explanation

Now, recall the relief of the ocean floor and its parts such as continental shelf, continental slope, abyssal plain and deeps or trenches.

The structure of ocean floor :

These days, not only are the surface or coastal areas of the ocean exploited but even advanced research is being carried out to see how the deeper part of the oceans can be useful to mankind.

- i) **The continental shelf :** The portion of the continents that is submerged under water and borders the coastal areas is known as a continental shelf. The continental shelf is of great importance to man. This part occupies about 7.6% of the oceanic area. They are broad, shallow and gently-sloping plains covered by water. The continental shelf does not extend into the ocean uniformly. Near some coasts, it is narrow while in some parts it may extend for hundreds of kilometres. For example, they are almost absent or very narrow along the coasts of Chile, Sumatra etc. while the Siberian coast near the Arctic Ocean is around 1500 km in width. Generally, its depth from the sea level is about 180 to 200 m.

As the sunlight reaches this part of the ocean bed, it is rich in plankton. These millions of microscopic organisms found in sea water are an important food for fish. Millions of fishes thrive here. The shelf has some of the richest fishing grounds in the world, such as the Grand Banks and Georges Bank in North America. In fact, the fish caught in the continental shelf form the backbone of the fisheries industry the world wide.

The continental shelves contain the world's largest reservoirs of natural oil and gas. For example, the Mumbai High in Arabian sea. Besides oil and gas, minerals are also found here. The concentrated

minerals are often in large enough quantities to be minable. Examples are diamonds, chromite, ilmenite, magnetite, platinum, gold and phosphorite deposits. Sand, gravel aggregates and industrial silica sand are the most important of hard minerals now extracted in the near offshore zone.

- ii) **Continental slope :** After the extent of continental shelf is over, there is a sharp drop in the ocean floor. The gradient of slope in this region can be between 2° to 5° . This is called continental slope. The depth of this slope extends from 200 m up to 4000 meters from sea level.

Due to its steepness, the continental slope stretches over a limited area. The deposition of sediments is also limited in this part. The continental slopes are generally considered as boundaries of continents. It covers about 8.5 percent of total ocean area. Methane hydrate, a compound of water and methane, is present on the continental slopes. e.g. The Krishna-Godavari offshore basin covering an area of 1400 km², is rich in methane hydrate. On the slope, we find many traces of submarine landslide activity, ocean canyons and huge avalanche fans. For example, Congo Canyon is a submarine canyon found near Africa.

- iii) **Abyssal plains :** Beyond the continental slope, lie the abyssal plains. They stretch over great distances. Over these plains, there are features such as sea mounts, mountains and plateaus. They have gentle slope and cover about 66 percent of the oceanic floor area. The relief on the plain is produced by volcanic and tectonic activities. Other components of the abyssal plain sediment include wind-blown dust, volcanic ash, chemical precipitates and occasional meteorite fragments.

The abyssal plains are often littered with nodules of manganese containing varying

amounts of iron, nickel, cobalt, and copper. These pea to potato-sized nodules are formed by the precipitation of minerals from the seawater onto bones or rock fragments. Currently, the deposits of manganese nodules are not being mined from the ocean floor, but it is possible that they could be collected and used in the future.

iv) The oceanic trenches : At places, deep, narrow and steeply sloping depressions are found on the ocean floor. These are called ocean deeps or ocean trenches. Generally, the shallow ones are called deeps whereas deeper ones are called ocean trenches. The oceanic trenches are the deepest parts of the oceans. These trenches can be thousands of metres deep. They generally occur along plate boundaries and are associated with active volcanoes and strong earthquakes. The Mariana Trench in the Pacific Ocean is around 11 km deep while the Java trench in Indian Ocean is around 7.7 km deep. The knowledge of ocean trenches is limited because of their depth and their remoteness.



Do you know ?

Trench exploration to date has been extremely limited. Only three humans have ever visited the sea floor below 6,000 meters. Much of what is known about trenches and the things that live there has been derived from the two sampling campaigns in the 1950s.

v) Oceanic ridges and plateaus : The submerged mountains on the ocean floor are called oceanic ridges. They are hundreds of kilometres wide and they extend for thousands of kilometres. Some oceanic ridges have flat, extensive tops. These are called oceanic plateaus. For example, Chagos plateau in Indian Ocean. At places, the peaks of oceanic ridges appear above

the ocean surface. These are called oceanic islands. They are of different types :

- a) Continental islands e.g. Madagascar Island, South-Western Indian Ocean.
- b) Volcanic islands e.g. Hawaiian Island, Pacific Ocean
- c) Coral islands e.g. Aldabra Islands, Indian Ocean.

Seamounts are isolated habitats that have evolved slowly over millions of years and they support communities having a high degree of endemism. Studies have shown that organisms found near islands and sea mounts have been new to science whenever they are discovered or tested for research. These properties make sea mounts of special ecological significance and they are of particular interest to conservationists and environmentalists.



Find out !

Find out the name and locations of islands located in India and list them in above given categories.

Besides the oceanic relief features described above features such as canyons, valleys, etc. are also found on the ocean floor. You can now understand the similarity between these features and landforms on the earth surface.

Ocean resources :

There are variety of resources found abundantly at different levels of ocean floor. They can be classified as 1) Biotic resources, 2) Abiotic resources.

1) Biotic resources : It include mainly plants and animals. The oceans provide a habitat for thousands of species of marine plants and animals, which are source of food for many organisms including man. Fish forms a valuable source of food and nutrients.

Coral reefs are major part of ocean ecosystem. In addition to fish, molluscs and

seaweeds are also found. Many sea animals provide oil, leather, glue, cattle feed, and other useful products. In the medicine industry, beside medicinal plant found under water, pearls and corals are widely used. Seaweeds grow easily in seawater and have been used as food for centuries. Seaweeds are also used for making products such as skin care ointment and also used as fertilizers.

There are micro-organisms which produce organic material. They are called 'Plankton'. They are of two types : Photoplanktons and Zooplanktons. They have various colours such as blue, green, red and yellow. The marine life mainly depends upon these planktons. Whales also eat planktons.

On the coasts, a large variety of vegetation is found. On tropical coasts, mangrove vegetation is found abundantly. For marine life, these mangroves are very important, because they provide food and shelter to them. Besides marine life, some other animals also exist in mangrove forest such as tigers in Sunderban. These mangrove forests provide wood for fuel, furniture and various products useful to man.



Do you know ?

The Great Barrier Reef lies off the northeast coast of Australia. It is the largest coral reef on Earth and one of the natural wonders of the world. It stretches for about 2,010 km and covers about 400 different kinds of corals. It is at great risk.

- 2) Abiotic resources :** The world's oceans contain tremendous abiotic resources which have been partially exploited till date. The most common resources are sodium chloride i.e. common salt. A large number of metallic and non-metallic minerals are found on the ocean floor, e. g. potassium occurs in large quantities. Limestones are

formed extensively in the tropical oceans of the world as a result of precipitate material by corals and plants. Gypsum forms during evaporation of sea water. The gypsum deposits are mined and converted into Plaster of Paris and used for construction. The most important minerals extracted from the sea floor are petroleum and natural gas.

To obtain fish or mineral oil, development of the technology is essential because they are available in deep oceans. While obtaining these from biotic and abiotic resources, precaution should be taken to maintain the ecological balance of the ocean environment. It is important to consider their uses with respect to sustainable development.

Use of oceans for other purposes :

- A) For energy :**
- i) Tidal Energy :** The phenomenon of tides releases large amounts of energy. Thus tidal energy can be used to generate electricity. However, there are certain difficulties in tapping the tidal energy. Efforts are being made to tackle these limitations. In 2016, a massive tidal turbine in the Bay of Fundy, Nova Scotia, began generating electricity for the first time—enough to power 500 homes. Efforts to increase installation are being carried out.
 - ii) Thermal energy :** The temperature differences of sea water helps in generating the energy. The surface water of the tropical region may have 25°C to 30°C of temperature while the deep sea water may have less than 5°C. This gradient of temperature is used to run a generator to produce electricity. Floating generators based on temperature differences have been designed in Belgium and Cuba
- B) For drinking water :** Due to high salt content in sea water, it is not suitable for drinking or for irrigation directly. But sea water can be converted into fresh water.

Desalination process is the removal of salt from sea water. It is done in several ways by heating or freezing water or by electrical processes. These methods are costly and can be implemented where water is desperately needed such as in a desert region. Countries such as Saudi Arabia, Oman, UAE, Spain, Algeria, Cyprus etc. use desalinated water for drinking.

The cost of desalination has kept desalination from being used more often in developing countries. There are environmental costs of desalination as well. Sea life can get sucked into desalination plants, killing small ocean creatures such as baby fish and plankton. This leads to upsetting of the food chain. Nevertheless, in the near future, many more countries may look towards oceans for potable water supply.



Find out !

India also produces water from desalination plants. Find out their locations with the help of internet.

C) Trade and Transport : Maritime transport is the transport of people or cargo by water. Transportation by water is cheaper than any other modes of transport. The seas and oceans are the most convenient natural medium for transport. The Atlantic Ocean route is the most important and busiest ocean route in the world because it joins the economically and industrially developed regions of the world such as North America and Western Europe.

D) Tourism : Ocean tourism comes in many forms like cruises, scuba-diving, fishing, beach tourism, etc. Such activities are increasingly becoming popular. In many areas, massive new tourist developments

have been built which include resorts and marinas. These activities, in turn, affect the ocean habitats and environment.

By mid 21st century, many countries may face a problem of food security. Besides food, other sources for development are energy, minerals, drinking water, mineral oil etc. These resources are limited on land and are available in specific areas but they are largely available in the oceans.

Our future on the earth may depend on knowledge of the oceans in an increasingly over crowded world.



Try this.

Various institutes are presently working for exploration of ocean, its climate, resources and its impact on our lives. Prepare a list of such institutes which are in India. With the help of internet, complete the table below. One has been done for you as an example.

Sr. No.	Name of the Institute	Location	Objectives
1.	NIO	Goa	Undertake scientific research on ocean surrounding India
2.			
3.			
4.			
5.			

Who owns the oceans?

We divide the Earth's terrain (Continental area) and establish geographic boundaries on land. The oceans have no apparent surface features - just a flat, vast expanse. This makes it difficult to divide, and so ultimately, we all own the oceans.

When ships were developed they could transport or carry humans across the globe. The governments that represented the oceans agreed that no one owned the oceans. This informal agreement was referred to as the Law of the Sea.

The modern foundation of ownership is the United Nations Convention on the Law of the Sea (UNCLOS 1982). It says that a country may claim an area extending 12 nautical miles from its coast as its own territorial sea. Additionally it can exploit 200 nautical miles of the water beyond its coast as its exclusive economic zone EEZ. The resources found there can be exploited by that country alone.

International Resources :

There are international institutions which regulate the ocean resources. The oceanic resources beyond 200 nautical miles of the Exclusive Economic Zone belong to open ocean and no individual country can utilise these without the concurrence of international institutions.



Try this.

Do you know that India has got the right to mine manganese nodules from the bed of the Indian Ocean from that area which lies beyond the exclusive economic zone. Identify some other resources which are international in nature



Do you know?

News clipping from March 2018.

Plastic bag has been found at the bottom of the Pacific Ocean's Mariana Trench, the world's deepest. This plastic bag was made 30 years ago. This highlighting the spread of ocean pollution. Numerous international teams working around the world on over 5,000 separate dives and using deep-sea remote vehicles helped study the ocean beds to discover what lies beneath. Over a third of the debris found was micro-plastic.

Marine pollution :

Importance of the ocean is increasing day by day in various ways, Human dependence on oceans is likely to increase manifold in the days to come. However, nowadays, the oceanic waters are getting polluted on a large scale. This causes deterioration of the natural quality of ocean water.

The leakages of oil from oil transporting ships, oil extraction from coastal areas, disposal of solid waste containing radioactive matter, atomic tests etc. are causing large scale pollution of oceanic waters. The effluents brought by river discharges, the disposal of waste from coastal cities, the waste from industries and many other similar factors are polluting the oceanic waters. As a result, the very existence of marine life is threatened.



Exercise

Q. 1) Complete the chain :

A	B	C
1) Continental Shelf	1) deeper part	1) Manganese nodules
2) Oceanic microorganisms	2) Abyssal plains	2) Whales
3) Oceanic trenches	3) fishing	3) Sunda
4) Vast flat area	4) plankton	4) Dogger Bank

Q. 2) Identify the correct correlation :

A : Assertion; R : Reasoning

- 1) A : Continental shelf is a storehouse of mineral oil and natural gas.

R : Continental shelf receives large quantities of load from continental areas.

- 1) Only A is correct
- 2) Only R is correct
- 3) Both A and R are correct and R is the correct explanation of A.
- 4) Both A and R are correct but R is not the correct explanation of A.

- 2) A: More deposition occurs in the continental slope.

R: The slope is steeper here.

- 1) Only A is correct
- 2) Only R is correct
- 3) Both A and R are correct and R is the correct explanation of A.
- 4) Both A and R are correct but R is not the correct explanation of A.

- 3) A : The islands are actually peaks of submerged mountains

R : Some peaks of submerged mountains come above the sea level

- 1) Only A is correct
- 2) Only R is correct
- 3) Both A and R are correct and R is the correct explanation of A.
- 4) Both A and R are correct but R is not the correct explanation of A.

- 4) A: The abyssal plains are the deepest parts of the ocean

R: They lie at the bottom of the ocean

- 1) Only A is correct
- 2) Only R is correct
- 3) Both A and R are correct and R is the correct explanation of A.
- 4) Both A and R are correct but R is not the correct explanation of A.

- 5) A : Sodium chloride and potassium are parts of inorganic oceanic resources.

R : Salt extraction is a major activity in coastal areas.

- 1) Only A is correct
- 2) Only R is correct
- 3) Both A and R are correct and R is the correct explanation of A.
- 4) Both A and R are correct but R is not the correct explanation of A.

Q. 3) Give geographical reasons.

- 1) Fishing has developed in continental shelves.
- 2) Our knowledge regarding the oceanic trenches is limited.
- 3) The ocean is a storehouse of minerals.
- 4) Like the land, there are landforms below the ocean too.

Q. 4) Write short notes on:

- 1) EEZ
- 2) Oceanic tourism
- 3) Abundance of minerals in oceans
- 4) Deposition and continental slope

Q. 5) Answer in detail:

- 1) The marine pollution is ultimately going to be harmful to the man himself. Discuss.
- 2) There is similarity in the relief on the land surface and the ocean bottom.
- 3) Discuss how development of oceanic tourism should be carried out without disturbing marine life.

Q. 6) Show the following on the map of the World:

- 1) Chagos Range
- 2) Mariana Trench
- 3) Dogger Bank
- 4) Mumbai High
- 5) Sunda Deep
- 6) Grand Banks
