9th Social Science Lesson 22 Notes in English

22] Hydrosphere

Introduction

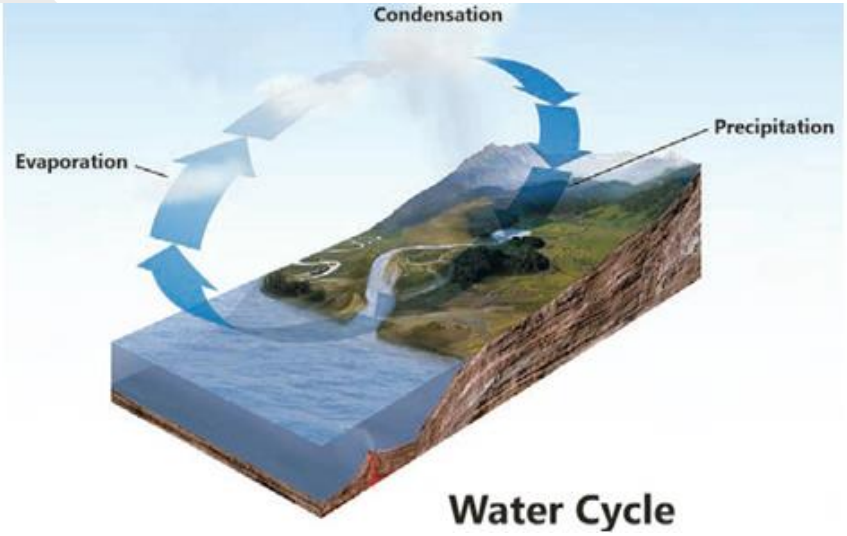
- We know that, our planet Earth consists of four spheres.
- They are the **Lithosphere, Atmosphere, Hydrosphere** and **Biosphere**.
- In the earlier chapters, we have studied about the Lithosphere and Atmosphere.
- We shall now learn the other two spheres namely **the Hydrosphere** and the **Biosphere**.

Hydrosphere

- One of the most indispensable natural resources on earth is water.
- **The Earth** is also called **the Blue planet**, as it holds water in abundance and thus stands unique among all other planets.
- **Hydrosphere** consists of **water** in various forms found on the earth.
- Over 97% of the water on the Earth's surface is confined to oceans.
- Less than 3% of water is held on land as glaciers, ice caps, groundwater, rivers, lakes, and also as the water vapour in air.

Hydrological Cycle

- The Earth's water is not static. It is always in **motion**.
- This continuous **movement of water** on, above and below the earth's surface is called **the Hydrological Cycle.**
- The three major processes involved in **the water cycle** are **evaporation, condensation** and **precipitation.**
- Water changes its form constantly i.e. Ice, water and water vapour.
- This process happens in the blink of an eye or even over millions of years.
- Water resources of the Earth can be broadly divided into fresh water and salt water.



Water Cycle

Fresh Water

- **Rain water** is considered to be the purest form of water, as it contains very less proportion of salts when compared to the oceans and seas.
- Hence it is called **fresh water.**
- A major part of fresh water is found in the frozen state in the form of ice caps and glaciers.
- Around 1% of it is found in the liquid state as rivers, streams, lakes, ponds etc.
- Surface water may also penetrate through porous rocks and gets collected beneath the Earth's surface. This is called **groundwater.**

Oceans

- The continents and oceans are however, not evenly distributed in the northern and the southern hemispheres.
- The northern hemisphere holds 61% of land whereas the southern hemisphere holds 81% of water.
- It is because of this pattern of land and water distribution, the northern hemisphere is called as **the land hemisphere** and **the southern hemisphere** is called as **the water hemisphere.**

- Oceans and seas are considered as resource bowl of the earth because of the immense availability of food, minerals etc.,
- Present distribution of the world's oceans and major seas are illustrated in the map.

Relief of the Ocean Floor

- The ocean basins are characterised by the following major relief features:
  A. **Continental shelf**
  B. **Continental slope**
  C. **Continental rise**
  D. **Deep sea plain or Abyssal plain**
  E. **Oceanic deep**
  F. **Oceanic ridge**

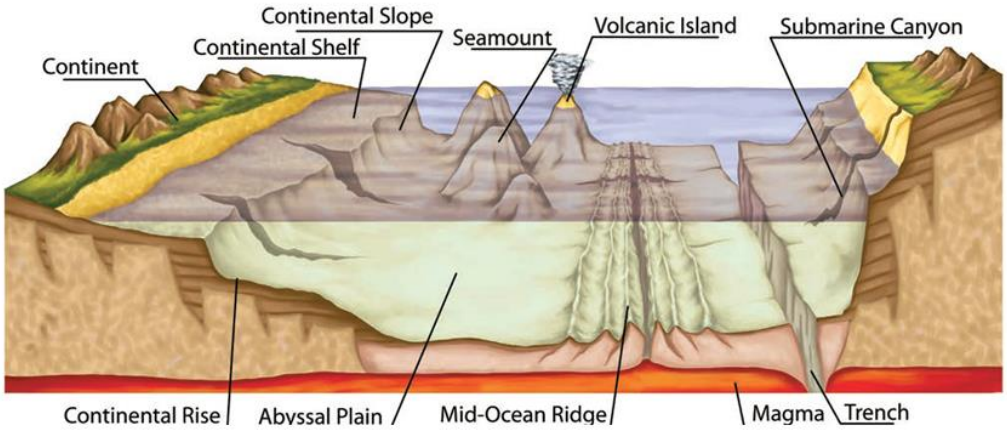
(A) Continental Shelf

- A **shallow** and **gently sloping platform** extending out from the adjoining continental land mass into the sea is called **Continental Shelf**.
- It is almost a **uniform zone of sea bed** with a gentle gradient.
- The continental shelf is of great significance for the following reasons:
- They are shallower, thus enables sunlight to penetrate through the water.
- This encourages **abundant growth of grass**, **sea weeds** and **plankton**.
- Hence these zones become **the richest fishing grounds** in the world. Eg.The Grand Banks of **Newfoundland**.
- The continental shelves have extensive **deposits of minerals** and **mineral fuels**.
- Hence, this zone becomes accessible for **oil drilling** and **mining activities**. E.g.Mumbai High in **Arabian Sea.**

ONGC:

- **Oil and Natural Gas Corporation** is India's largest oil and gas exploration and production company.
- Its latest estimate is that about **20 million tons of oil reserves** are found west of Mumbai High off shore.

Major Relief Features of the Ocean



(B) Continental Slope

- A steep slope which descends from the edge of the continental shelf to the deep ocean-bed is called **continental slope**.
- It forms a boundary between **the Continental Crust** and **the oceanic crust**.
- This zone is free from deposits as they are steep.
- The most important characteristic of continental slope is the presence of deep canyons and trenches.
- Due to the low penetration of sunlight, the slope has nearly **freezing temperature**.
- Hence aquatic life has **very slow rate of metabolism**.

(C) Continental Rise

- At the base of the continental slope is a gently sloping **layer of sediments** which merge into the deep-sea floor.
- This underwater feature found between **continental slope** and **abyssal plains** is called **the continental rise**.
- It consists of submarine fans which are similar to the **alluvial fans** found on land.

(D) Deep Sea Plains or Abyssal Plains

- The deep sea plains or abyssal plains are **underwater plains** found on **the deep ocean floor.**
- These plains extend from **continental rise** to **the mid oceanic ridges**.
- The gradient of the slope is very gentle and it appears as a uniform flat and featureless plain.
- These plains are usually covered by the **thick layer of sediments** composed of clay, silt and sand, brought by the rivers.
- These are often characterized by features like **abyssal hills, sea mounts, guyots, coral, atoll** etc.

(E) Oceanic Deeps

- **Trenches** are the deepest part of the oceans and occupy about 7% of the total relief of the ocean floor.
- The ocean temperature in the trench is slightly cooler than the **freezing temperature**.
- As they are sediment free, most trenches are **V-shaped** with **steep sides**.
- **Epicentre** of the great earthquakes are all found in the trenches.

(F) Oceanic Ridge

- Oceanic ridge is a continuous **submarine mountain chain**.
- They are made of young basaltic rock formed when **two tectonic plates** moves apart.
- The mid-ocean ridge is probably the most extensive single feature of the earth's topography.
- Two of the most well known **mid- ocean ridges** are the **Mid-Atlantic Ridge** and the **East Pacific Ridge**.
- The Mid-Atlantic Ridge is the largest **unbroken oceanic ridge**.

Movement of the Ocean Water

- The ocean water is **dynamic**.
- Temperature, salinity, density, external forces of the sun, moon and the winds keep the ocean waters in movement, both horizontally and vertically.
- **Waves** and **currents** are in **horizontal motion** while **tides** have **vertical motion**.

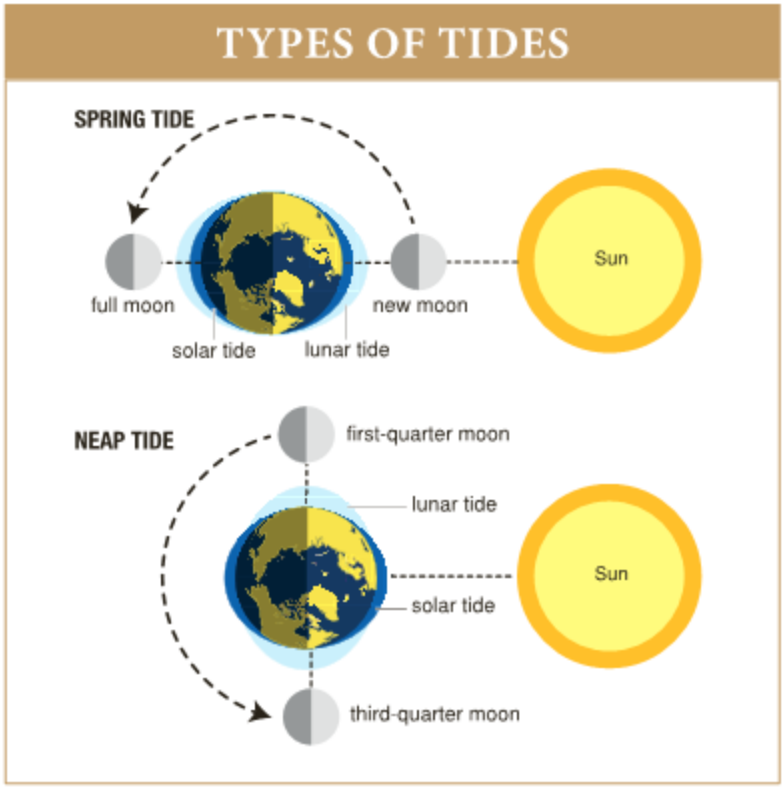
(A) Waves

- Of all the **movements of the oceans**, sea waves are considered to be the strongest.
- Sea waves are ripples on water caused when winds blow over the sea.
- The height of these waves depends on the speed of wind, its duration and the direction from which they blow.
- Sometimes waves are also caused by tremors felt on the ocean floor.
- Such waves are quite destructive and called **Tsunami**.

(B)Tides

- The periodic **rise and fall of sea water** due to the gravitational pull of the sun and moon on earth are called **tides**.
- They are classified broadly into **Spring tides** and **Neap tides.**
- When the Sun, Moon and Earth are aligned in the same line, the collective gravitation pull of the sun and moon on earth's water strengthens to form a high tide known as **spring tide.**
- Such tides always occur on full moon and new moon days.

- When the sun and the moon are at right angles, their gravitational forces work against each other, causing a low tide called **neap tide**.
- A neap tide occurs between two spring tides i.e., twice a month, when the first and last quarter moon appears.



(C)Ocean Currents

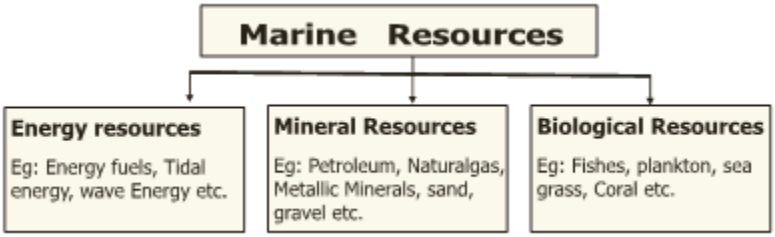
- The movement of oceanic water on the surface and at the depths in a definite direction is called **ocean current**.
- **Ocean currents** are in clockwise motion in **the northern hemisphere** and in the anti-clockwise motion in **the southern hemisphere**.
- The factors that generate ocean currents are:

I **Earth's rotation**
II **Prevailing winds and**
III **Differences in temperature and salinity of ocean water.**

- On the basis of temperature, ocean currents are classified as **warm currents** and **cold currents.**
- The movement of ocean currents from the high latitudes (temperate and polar zones) towards low latitudes (tropical zones) is called **cold current**.
- Eg. Labrador in **Atlantic Ocean** and Peruvian cold current in **South Pacific Ocean**.

Marine Resources

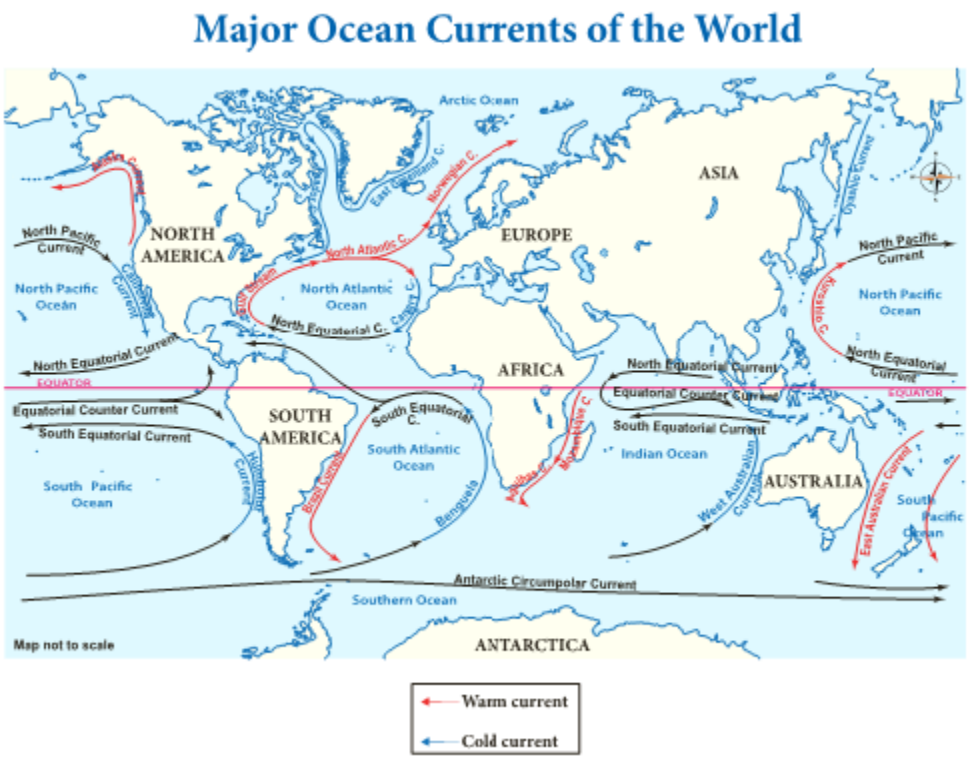
- **The biotic** and **abiotic resources** found in the oceanic water and at the bottoms are called **marine resources**.
- The ocean's resources play a vital role in sustaining the needs of society.
- A diverse array of marine organisms is used for food, medicine, cosmetics, and a wealth of industrial applications.
- The world's demand for energy, minerals and water have become increasingly dependent on non-living marine resources.



Conservation of Marine Resources

- Oceans are **the life blood of planet earth** and **mankind**.
- The humankind depends on the marine resources for its **survival**.
- They are also essential for the economic prosperity, social well- being and quality of life.
- Oceans have extensive deposits of **oil reserves**.
- Besides a major fishing ground, it helps in generating non-conventional energy, development of many ports and harbours for **trade activities**.
- **Coastal tourism** also attracts people around the world, thereby contributing to the economy of many countries.

DISTRIBUTION OF MAJOR OCEAN CURRENTS AND EFFECTS		
Ocean	Name of the Current	Effects
South Atlantic Ocean	Benguela Current [Cold]	Leads to foggy conditions along the coast of Namibia. Helped in the development of Namibian & Kalahari deserts
North Atlantic Ocean	Canaries [Cold]	Influences the extension of Sahara Desert
	Gulf Stream [Warm]	Its confluence with the Labrador current produces heavy fog along the coast of Newfoundland, obstacles the navigation. Hence, Newfoundland is one of the major fishing grounds of the world.
	North Atlantic Drift [Warm]	It keeps the ports at higher latitudes ice-free throughout the year. Eg. Port of Rorvik (Norway), Murmansk and Severodvinsk (Russia)
	Labrador [Cold]	Its confluence with Gulf Stream creates fog and hinders navigation.
South Pacific Ocean	Peruvian / Humboldt Current [Cold]	It is one of the causes for the formation of Atacama desert. Change in the nature of Peruvian current, is also associated to the formation of "ELNINO".
North Pacific Ocean	Kuroshio Current [Warm]	It plays a vital role in carrying large amount of heat to the adjacent land areas and forms cloud cover that cause rainfall.
	Oyashio / Kurile Current [Cold]	Its confluence with the Kuroshio current produces heavy fogs around Hokkaido, which become potential hazards for navigation. Hence, Hokkaido acts as the major fishing ground of the world.
	Alaska Current [Warm]	Keeps the seaports of Alaska open throughout the year.
	California Current [Cold]	Leads to foggy conditions along the coast of California. It is one of the reason for the formation of Arizona & Sonata deserts.
Indian Ocean	West Australian Current [Cold]	Leads to foggy conditions along the western coast of Australia. It helped in the genesis of west Australian desert.



The Great Barrier Reef

- The Great Barrier Reef is **the world's largest coral reef system** composed of 2,900 individual reefs and 900 islands stretching for about 2,000 kilometres.
- It covers an **area** of about **3,50,000 km.**
- The reef is located in **the Coral Sea**, off the coast of Queensland, **Australia**.
- The Great Barrier Reef can be seen from the outer space.
- This sprawling coral reef system is one of the most biologically diverse places on the planet.
- Coral reefs are built by billions of tiny organisms, known as **Coral polyps**.
- **CNN** labelled it as one of **the seven natural wonders of the world**.

MORE TO KNOW:

The land of Thousand Lakes

- Finland is known as the land of thousand lakes. There are **1,87,888 lakes** in **Finland**.

Aquifers

- **Water table** is a level below the ground, where water is found collected beneath the Earth's surface.
- **Aquifers** are porous rock strata filled with water, found below the earth's surface.

'Hero for the Planet'

- **Sylvia Earle** is a famous American Oceanographer .
- She was named as the first, **'Hero for the Planet'** by Time magazine for her efforts towards marine life protections.
- **Jacques-Yves Cousteau** (1910-1997) was a famous French Ocean explorer, who conducted extensive under-sea investigations.
- He belonged to the information service of the French Navy, and was sent on missions to **Shanghai** and **Japan** (1935–1938) and in **the USSR** (1939).
- **Honours Cross of War 1939–1945** (1945)
- **U.S. Presidential Medal of Freedom** (1985)

A Hypsometric Curve

- **A Hypsometric Curve** is a graphic representation which shows **the height** of a certain place found on **land** and the **height of ocean features** at sea.
- **'Hypso'** means **height** in Greek.

'Eye'

- **Dragon Hole** is the deepest known underwater sink hole in the world. The local fishermen call it the 'eye' of **the South China Sea.**

Abyssal plains

- Abyssal plains in the **Atlantic** and **Indian Oceans** tend to be extensive than the Pacific Ocean because, majority of **the world's largest rivers empty** their sediments into either Atlantic or Indian Ocean. E.g. **Amazon**, **Ganga** and **Brahmaputra rivers**.

Fathoms

- A nautical measurement of the depth of water in the ocean.

Isobath

- An imaginary line on a map joining the points of equal depths.

Isohaline

- An imaginary line on a map joining the points of equal salinity in oceans.

Wave energy power plants

- The energy of the falling wave water is used to turn **hydro turbines** to generate power.
- Wave energy power plants have been installed at **Vizhinjam** in Kerala coast and **Andaman** and **Nicobar islands** of India.

Tidal Energy

- Potential tidal energy zones of India are **the Gulf of Khambhat**, **Gulf of Kutch** and **Sundarbans**.

MARITIME BORDERS

- **Maritime boundary** of most **the Countries** is fixed to be **12 nautical miles** from the **baseline**.
- This was fixed by **the U.N. Convention on the Law of the sea 2013** where as **Jordan** and **Palau** have 3 nautical miles as their maritime boundary and Benin, Republic of Congo, EI Salvador, Peru and Somalia have 200 nautical miles.

NIO

- NIO (**National Institute of Oceanography**) was established in 1st January 1966.
- The headquarters of NIO is located at **Dona Paula, Goa**.
- It Conducts research and observations to understand oceanic features, **Ocean engineering**, **marine Archaeology** etc.

The National Aquatic Animal

- **The Gangetic Dolphin** was declared the National Aquatic Animal in 2010. This has become an **endangered species**.