Marine Resources: Classification and Sustainable Utilization

Semester – V
DSE1: Hydrology and Oceanography
Unit II: Oceanography

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Introduction

- Marine resources are physical and biological entities that are found in seas and oceans that are beneficial to man.
- Physical sources - those things that are not part of life processes. Example: Sand and Gravel, Evaporative salts, Fresh water, Methane hydrates,etc.
- Biological sources - anything attributed to lifeforms. Example: Fish, Marine mammals, etc.

Types of Marine Resources

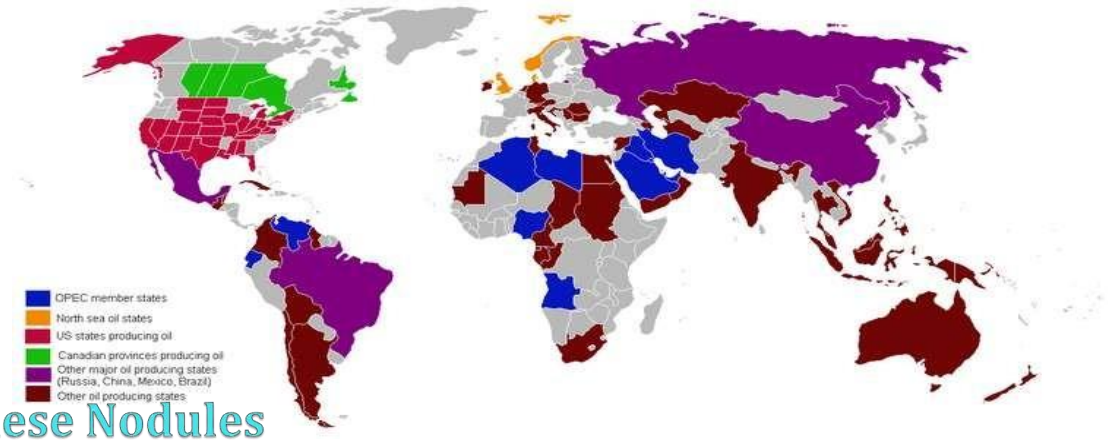
- Marine mineral resources.
- Marine energy resources.
- Marine food resources.

Marine Mineral Resources

- Marine mineral resources are found either dissolved in the seawater or they can be found as deposits.
- The minerals mined for resources can be further classified into five groups.
- Construction material, including sand, gravel, and other high bulk materials.
- Industrial materials, including silica sand, aragonite, phosphates, and sulfur.
- Metallic minerals, like gold, platinum, tin, titanium, and rare earth metals.
- Metalliferous oxides, which contain manganese, copper, nickel, and cobalt.
- Metalliferous sulfides, including copper, lead, zinc, chromium, and gold.

Petroleum

- Petroleum is a naturally occurring, yellow-black in colour oil or liquid found in geologic formations beneath the earth surface.
- It consists of hydrocarbon of various molecular weights and other organic compounds.



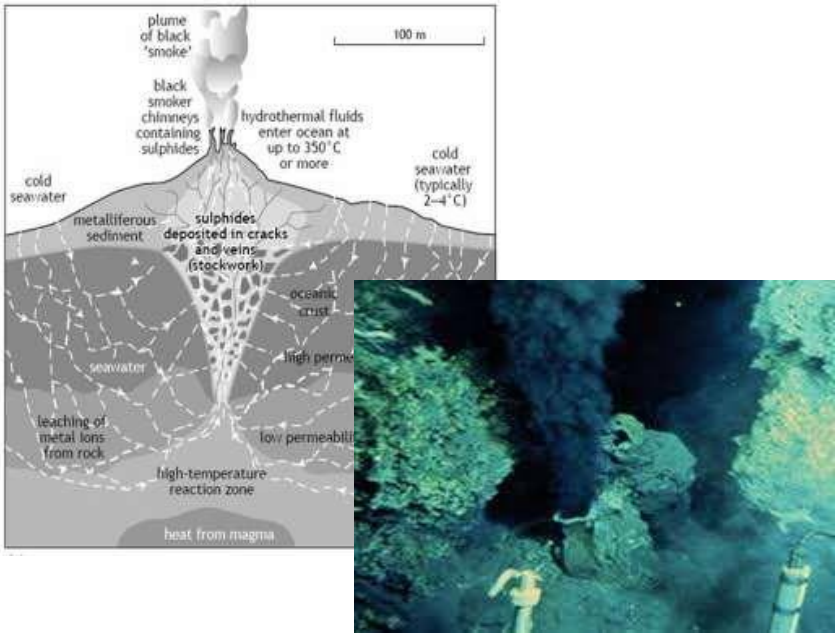
Manganese Nodules

- Manganese nodules, also called as poly-metallic nodules (Ni, Co, Cu), are rock concretions on the sea bottom formed of concentric layers of iron and manganese hydroxides around a core.
- The chemical elements are precipitated from seawater or originate in the pore waters of the underlying sediments.

Volcanogenic Massive Sulphides

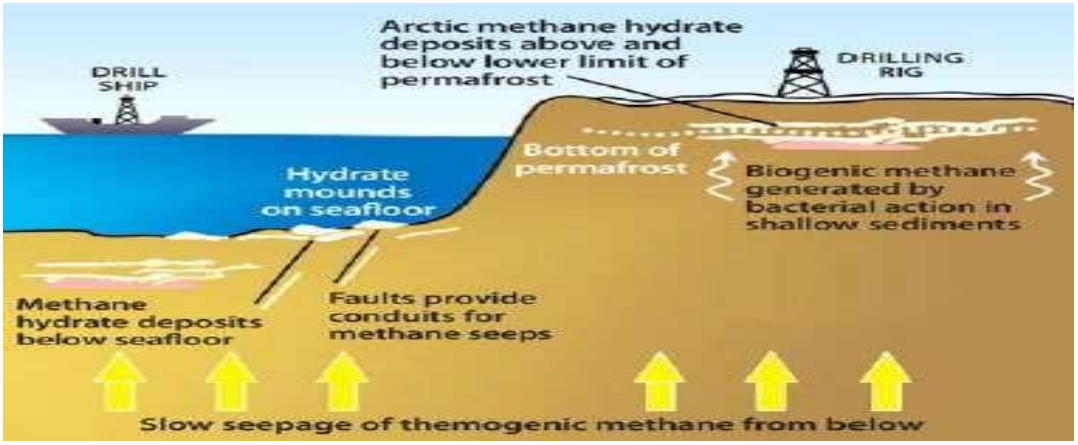
- Volcanogenic massive sulfide ore deposits, also known as VMS ore deposits, are a type of metal sulfide ore deposit, mainly copper-zinc which are associated with and created by volcanic-associated hydrothermal events in submarine environments.

- They are sulfur-rich ore that originates at "black smokers".



Methane Hydrates

- Methane hydrate is a cage-like lattice of ice inside of which are trapped molecules of methane, the chief constituent of natural gas.
- If methane hydrate is either warmed or depressurized, it will revert back to water and natural gas.



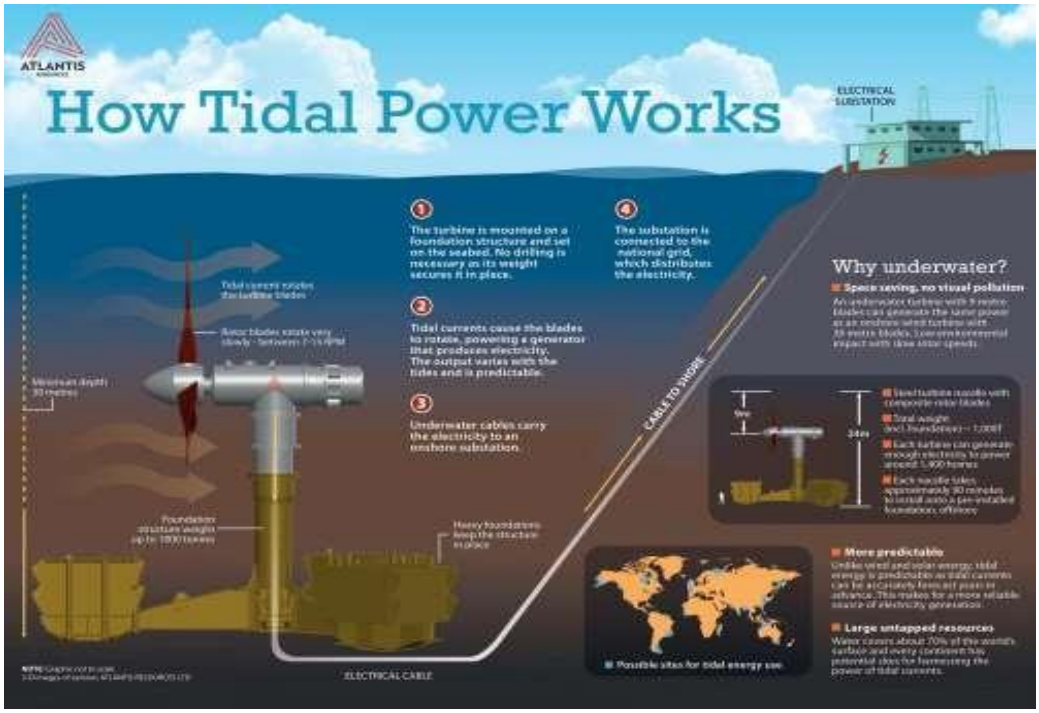
Marine Energy Resources

- Various renewable energy resources have their source in the marine waters. The sea is thus an inexhaustible source of energy.
- Tidal Energy.
- Wave Energy.
- Wind Energy.

Tidal Energy

- Tidal power or tidal energy is a form of hydro-power that converts the energy obtained from tides into useful forms of power, mainly electricity. Although not yet widely used, tidal energy has potential for future electricity generation.

- Sihwa Lake Tidal Power Station, South Korea - 254MW. La Rance Tidal Power Plant, France - 240MW. Swansea Bay Tidal Lagoon, United Kingdom - 240MW. MeyGen Tidal Energy Project, Scotland - 86MW.



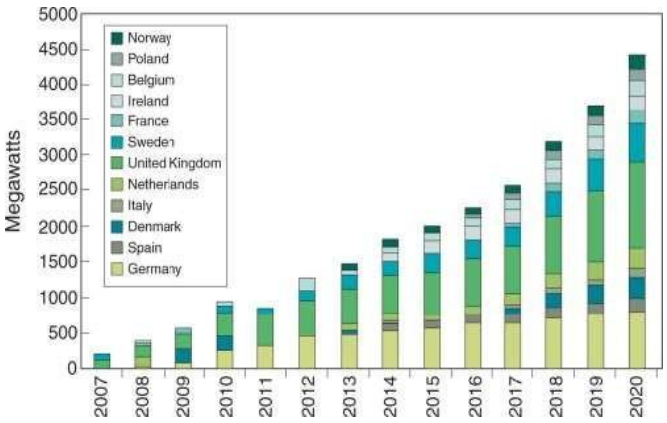
Wave Energy

- Wave power is the transport of energy by wind, and the capture of that energy to do useful work – for example, electricity generation, water desalination, or the pumping of water into reservoirs.

Country	Installed capacity (MW)	Capacity in consented projects (MW)
United Kingdom	3.7	Several pilot plants
Portugal	0.29	0.3
Spain	0.29	0.3
Denmark		0.11
China	0.35	2.8
Sweden	0.18	10.4-10.6
New Zealand	0.04	0.22
Belgium		20
South Korea	0.5	0.3
Norway	0.2	
USA		1.36

Offshore Wind Energy

- Wind power is the use of air flow through wind turbines to mechanically power generators for electric power. Wind power, as an alternative to burning fossil fuels, is renewable, widely distributed, clean, produces no greenhouse gas emissions during operation, consumes no water, and uses little land



Marine Food Resources

- Ocean contain variety of living organisms, where some of them serve as a food for human.
- Fisheries : Highly useful source of human nutrition.
- Mollusks : shelled creatures
  - oysters, mussels, clams, and squid/octopus.
- Crustaceans : crabs, shrimps, and lobsters.

Uses of Marine Resources

- Fisheries:- Oceans contain some of the largest and most valuable fisheries resource in world. Fishes mostly use for food.
- Oil and gas:- Oceans Contain significant oil and gas resource potential as evidenced by recent discoveries and on-going research.
- Minerals:- Many minerals can be mined from the deep sea, such as gold, nickel, cobalt, copper, manganese and zinc; and with limited reserves on land, deep-sea mining is an attractive, albeit very expensive prospect.
- Sand and gravel:- Marine aggregates are used mainly in the construction industry for building, and for the manufacture of concrete. The UK alone uses 13 million tonnes of sand and gravel each year for construction.

- Marine tourism:- Humans use the sea for leisure in many different ways, from scuba diving to whale watching, surfing to sailing, jet-skiing to fishing.
- Habitats:- Marine habitats, such as coral reefs, support biodiversity, which we rely on for food (fish), medicines(from certain marine species we get painkillers and cancer drugs), tourism (e.g. fishing and scuba-diving).
- Nutrient cycling:- Nutrients are essential to life - without them, plants could not grow, and we could not survive. Nutrient cycling is the storage, cycling and maintenance of nutrients by living organisms, and microscopic animals.
- Renewable energy:- Oceans have the richest and most accessible renewable energy (wind, wave and tidal) resources in the world.
- CO2 capture and storage:- One way that scientists are trying to mitigate climate change is the capture and storage of carbon-dioxide from the atmosphere.