

2016 : Bring out the various ecological problems associated with the exploitation and use of Ocean and their resources

or

2018 : Describe the potential marine energy resources with reference to their benefits, harvestability and environmental impacts.

or

2020 : Marine resources are economically very significant. Discuss citing suitable examples

or

2023 : Given an account of marine resources and their economic significance. How marine pollution affected such resources

Frame All these questions relates to marine resources with common benefits. 2016 and 2023 questions requires us to specifically include ecological problems and marine pollution. Generally with every answer on general marine resource or specific - harvestability, distribution and challenges must be included.

Answer Marine resources includes wide spectrum of Physical, biological and nonextractive resources. In spite of their abundance, marine resources provide only a fraction of the world wide demand for raw material human food and energy. It is however that contribution of marine resources are becoming significant and thus proper management and governance of their allocation is important

Categories of Marine resources includes →

- ① Physical ② Energy ③ Biological ④ Nonextractive

① Physical resources results from the deposition, precipitation or accumulation of useful substances in ocean or seabed. These also includes - fresh water (through desalination process)

a) Methane hydrate - the largest known reservoir of hydrocarbons on earth is not coal or oil, but methane laced ice crystals - methane hydrate - in the sediments of some continental slopes.

These exists in thin layers 200-500 meters below the seafloor, where they are stable and long lived. When brought to the warm, low pressure conditions at ocean surface, the sediment ~~freezes~~ fizzes vigorously as methane escapes. It burns vigorously if ignited.

⇒ methane as powerful GHG has env'tal challenges related to it

- b) Sand and Gravel - considered second in terms of value to oil and natural gas. About 1:1 of world's total sand and gravel production is scraped and dredged from continent shelves each year, but sea floor supplies about 20% of sand and gravel for countries like Japan and UK. The sand about 97% CaCO_3 is used for Portland cement, glass, animal feed supplements and reduction of soil acidity.
- sand suction dredging creates habitat destruction for both pelagic and benthic organisms
- c) Magnesium and Magnesium Compounds - Magnesium is 3rd most abundant dissolved element, precipitates from sea water; mainly in forms of magnesium chloride and magnesium sulfate salts. Magnesium metal is strong, light weight material used in aircraft and structural applications - can be extracted by chemical and electrical means. World wide about half of production of metallic magnesium is derived from seawater.
- Magnesium compounds are valuable in chemical processes, food, medicines, soil conditioners and in lining of high temp furnaces.
- d) Salts - The ocean salinity varies from 3.3% - 3.7% by weight. When seawater evaporates, the major remaining constituents ions, combines to make various salts - table salt making slightly more than 78% of total salt residue. - $\frac{1}{3}$ being produced from seawater

Magnesium salts are used as source of magnesium metal
 Potassium salts are processed into chemicals and fertilizers
 Bromine component of medicines, chemical processes
 Gypsum important component of wall board

e) Manganese nodules - littering the abyssal plain, involves iron, manganese, copper, nickel and cobalt content makes them attractive to industries

f) Others Phosphorite deposits, Metallic sulfides and mud - largely around hydrothermal vents. Metals mainly zinc, iron, copper, lead, silver combines with sulphur - are at elementary levels of extraction.

② Energy Resources

a) offshore petroleum and natural gas (32% & 28% respectively) comes from seabed. Also third of known world reserves lie along continent margins. Both these are found together beneath a dome of impermeable cap rock, within pore spaces in rocks

b) Waves and currents waves are most obvious manifestation of oceanic energy. Extensive use of wave power generators - deprives life cycle of marine organisms.

c) Thermal Gradient - greatest potential for energy generation harnessed by devices - Ocean Thermal Energy Conversion - OTEC Plants.

③ / Biological Resources . Compared to the production from land based agriculture, the contribution of marine animals and plants to human intake is small - around 4%.

a) Fishes, Crustaceans and Mollusks - most valuable living marine resources. Of the thousands of species fewer than 500 species are regularly caught and processed. Some of the commercially harvested fishes - Cod, Haddock, Hake (bottom) Sardine, Anchovy, Herrung, Mackerel, Tuna (pelagic), Krill, Shrimp, Lobster Crab (Crustaceans) Oysters, Calm, Octopus, Squid (mollusks)

→ overfishing as challenge is surpassing maximum sustainable yield, along with bykill are unsustainable.

b) Whaling - hunted to provide for meat, oil, illumination industrial products, cosmetics, fertilizers. All major species Fin whale, Sperm, Sei, Blue and humpback whale are still in danger of total extinction.

c) Fur bearing mammals - Eight species of seals and one species of sea lion are of economic importance. The harp seal of Labrador and Barents sea is the most common harvest.

d) Botanical resources - marine plants - as algin - used for stiffen fabric, emulsion form, and suspensions abrasives. Seaweeds are consumed directly also