Environment Class 05

28th February, 2024 at 9:00 AM

A BRIEF OVERVIEW OF THE PREVIOUS CLASS (9:07 AM)

TYPES OF ECOSYSTEM (9:09 AM)

- Natural and manmade.
- Terrestrial and Aquatic.
- **Terrestrial ecosystem:**
- Forests.
- Grasslands
- Mountains.
- **Aquatic Ecosystem:**
- Freshwater Ecosystems such as lotic and lentic.
- Saline water ecosystem.
- Brackish water.
- **Wetland Ecosystem:**
- Wetlands are ecosystems saturated with water either seasonally or permanently.
- They are characterized by the presence of standing water, saturated soil, and vegetation adapted to such conditions.
- Many of the wetlands are ecotones where terrestrial and aquatic habitats meet.
- They can be divided into general categories coastal(tidal)wetlands and non-tidal wetlands.
- **Based on various characteristics they can be divided into:**
- **Marshes-** Grassy areas, do not usually contain many trees.
- **Swamps-** Wetlands with the presence of woody plants and trees.
- **Bogs-** Known for acidic peaty soil. They accumulate peat a deposit of dead plant material.
- Many bogs are dominated by sphagnum mosses.
- **Fens-**They are similar to bogs but are fed by groundwater.
- **Peatland-** These are terrestrial wetland ecosystems in which waterlogged conditions prevent plant material from fully decomposing which results in a net accumulation of peat.
- **Significance of wetlands:**
- They provide habitats for a vast range of plant and animal species, many of which are rare and endangered and known for very high biodiversity
- Source of food. The well-managed rice-paddy system, fish, mollusks, crustaceans.
- They act as nature's water filter removing pollutants, sediments, and harmful nutrients from water.
- They act as sponges absorbing excess rainfall and reducing flood peaks.
- Coastal wetlands such as mangroves reduce the impact of storm surges and prevent coastal erosion.
- Wetlands store vast amounts of carbon and play a role in climate change mitigation.
- They offer recreational opportunities like fishing boating and bird watching.
- **Many wetlands are threatened because of:**
- Drained to create agricultural lands.
- Land reclamation for urban expansion.
- Discharge of industrial, and agricultural pollutants.
- Overfishing.
- Water divergence projects such as Dams.
- Climate Change:- Rising Sea levels can inundate coastal wetlands.

RAMSAR CONVENTION (9:49 AM)

- **Ramsar convention 1971:**
- It uses a broad definition of wetlands which includes all lakes, rivers, underground aquifers, swamps, marshes peatlands, Estuary, mangroves, Coral reefs, and also human-made sites such as fish ponds, rice paddy, and reservoirs.
- **The convention has three pillars:**
- Work towards wise use of all wetlands.
- Designate suitable wetlands for the list of wetlands of international importance. Also known as Ramsar sites.
- Cooperate internationally on transboundary wetlands.
- It's not a legally binding convention.
- India is a member of it.
- Wise use can be defined as the maintenance of the ecological character of wetlands achieved through ecosystem approaches within the context of sustainable development
- Convention also maintains the Montreux record a register of Ramsar sites where changes in ecological character have occurred or occurring or are likely to occur as a result of human interference.
- In India as of now there are 80 Ramsar sites, 2 sites are in Monteux Records Keoladeo National Park aka Bharatpur Bird Sanctuary, Loktak Lake Manipur.
- Chilka Lake of Odisha was part of the record but later removed.
- **Fact about peatland:**
- Peatlands cover only 3 % of global land surface but they store twice the carbon as in all of the world’s tropical forests.
- The largest peatland is found in the Congo basin.
- The United Nations environment program has a dedicated mechanism called the **Brazzaville Declaration for better management of this peatland.**
- The government of India started a national wetland conservation program in 1986 to designate wetlands and work for their conservation.
- As of now there is a legislative framework for wetland conservation and management rules 2017 under Environment Protection Act 1986.
- The rules apply to all the wetlands notified by the central government, state government, UTs, and Ramsar sites except:
- River channels, paddy fields
- Human-made construction for drinking purposes
- Salt production
- Aquaculture
- Irrigation
- Recreation
- Wetlands covered under Indian forest in 1927, Wildlife Protection Act 1972, Coastal Regulation Zone notification
- Under the rules national wetland committee has been set up under the Ministry of Environment Forest and Climate Change and state wetland authorities have been constituted.

- **Q. What is wetland? Explain Ramsar's concept of wise use in the context of wetland conservation. Site two examples of Ramsar sites in India (2018 UPSC)**
- **Q. Comment on the National wetland conservation program initiated by the government of India and name a few wetlands of international importance included in the Ramsar sites. (150 words /10 Marks)**

MANGROVE FORESTS (10:52 AM)

- Mangrove is a shrub or tree that grows in coastal, saline, or brackish water. They are called halophytes.
- They are typically found in tropical and subtropical tidal areas along coastlines.
- They thrive at the interface between land and Sea.
- They are greatly influenced by tides.
- They bring nutrients and help in the disbursal of propagules (seedlings).
- Despite such tough conditions mangrove trees have adapted to these conditions
- **Some of the adaptation mechanisms are:**
- **Prop roots**- They give support in the soft mud and allow the plant to combat erosion
- **Pnuetophores-** These are specialized root structures that stick up out of the soil like snorkels and help in gas exchange because water-logged conditions restrict water availability.
- **Salt secretion**- Some mangroves have dedicated glands that can excrete excess salt through their leaves.
- **Viviparity-** rather than producing dormant resting seeds like most flowering plants many mangroves have viviparous seeds, they start to germinate while still attached to their parent.
- Mangroves help in coastal protection from erosion, storm surges, cyclones, and carbon sequestration.
- High biodiversity.
- Food security for local people
- Etc
- Mangroves are threatened because of deforestation, pollution such as oil spills, plastic waste, toxic chemical discharge, overfishing, urban development, and climate change.
- In India largest mangrove forest in the world Sundarbans is located in West Bengal.
- 2^{nd} largest mangrove forest in India is Bhitarkanika.
- Gujarat, A& N also have large mangrove cover.

CORAL AND CORAL REEFS (11:13 AM)

- Corals are marine invertebrates of the **phylum Cnidaria.**
- They are small animals like polyps and typically form compact colonies of many identical individual polyps.
- Each polyp has a soft body topped by a mouth with tentacles to protect soft bodies.
- Polyp secrete limestones which become its exoskeleton.
- Over many generations colonies thus create skeleton characteristics of the species which can measure up to several meters in size.
- Coral reef is an underwater ecosystem characterized by reef-building corals.
- These are formed of colonies of coral polyps held together by calcium carbonate (limestone).
- Some corals can catch plankton and small fish using their tentacles.
- Most of the corals obtain the majority of energy and nutrients from photosynthetic unicellular dinoflagellates commonly known as Zooxanthellae.
- The beautiful color of coral is because of zooxanthellae.
- **Benefits of coral reef:**
- They occupy less than 0.1 % of the world's Ocean area yet provide a home to at least 25 % of all marine species
- Protects coastline from storms and erosion.
- They provide food, and medicinal resources to local people.
- They are one of the most famous tourist spots which contribute to the local economy.

CORAL BLEACHING (11:40 AM)

- Whenever coral becomes stressed they expel the symbiotic algae and as a result, they lose their color **turning white. This is called Coral bleaching.**
- Coral can survive a bleaching event, but when they are under more stress subject to morality.
- **Major causes of coral bleaching:**
- Temperature stress, 1-2 % increase can induce bleaching
- Excessive sunlight, UV rays exposure
- Ocean acidification-> reducing pH value of seawater.
- Variation in salt concentration of seawater
- Chemical pollution, oil spills, and the release of toxins in seawater among others

RESTORATION OF CORAL REEF (11:47 AM)

- Biorock technology:
- This involves metal structures often made of steel, submerged in seawater.
- A low-voltage current is applied to this structure using solar panels or wind turbines. This leads to an electrolytic reaction and precipitation of calcium carbonate on a metal structure.
- Small fragments of live corals are transplanted onto the structure because of the availability of calcium carbonate, corals grow rapidly and overall this can be more resilient to environmental stress such as increased acidity.

BIOME (11:56 AM)

- Its bio-geographical unit consists of a biological community that has formed in response to the physical environment in which they are found and the shared regional climate.
- Biomes may span more than one continent.
- **Some of the Most Prominent biomes of the earth are:**
- Tropical rainforest.
- Temperate forest.
- Tropical grassland.
- Temperate grassland.
- Mediterranean biome (chaparral biome)
- Tundra and taiga(Boreal forest).

Note 1- refer to the handout shared in this class for details of Biomes etc
THE TOPIC OF THE NEXT CLASS-Biodiversity etc