

Q.) Discuss the causes of depletion of mangroves and explain their importance in maintaining coastal ecology?

Introduction

- Mangroves are salt-tolerant vegetation that grows in intertidal regions of rivers and estuaries. They are referred to as 'tidal forests' and belong to the category of 'tropical wetland rainforest ecosystem'.

Threats

- More than 35% of the world's mangroves are already gone. The figure is as high as 50% in countries such as India, the Philippines, and Vietnam, while in the Americas they are being cleared at a rate faster than tropical rainforests.

Causes of Depletion of Mangroves

River changes

- Dams and irrigation reduce the amount of water reaching mangrove forests, changing the salinity level of water in the forest. If salinity becomes too high, the mangroves cannot survive. Freshwater diversions can also lead to mangroves drying out.
- In addition, increased erosion due to land deforestation can massively increase the amount of sediment in rivers. This can overcome the mangrove forest's filtering ability, leading to the forest being smothered.

Sea level rise and coastal erosion

- Due to global warming, the sea levels are continuously rising. The rising sea levels have flooded large areas of mangrove forests. This has resulted in their depletion. This has been supplemented by continuous erosion by sea towards the land.

Destruction of coral reefs

- Coral reefs provide the first barrier against currents and strong waves. When they are destroyed, the stronger-than-normal waves and currents reaching the coast can undermine the fine sediment in which the mangroves grow. This can prevent seedlings from taking root and wash away nutrients essential for mangrove ecosystems.

Overfishing

- The global overfishing crisis facing the world's oceans has effects far beyond the directly overfished population. **The ecological balance of food chains and mangrove fish communities can also be altered.**

Clearing

- Mangrove forests have **often been seen as unproductive and smelly, and so cleared to make room for agricultural land, human settlements and infrastructure (such as harbours), and industrial areas.**
- More recently, **clearing for tourist developments, shrimp aquaculture, and salt farms has also taken place.** This clearing is a major factor behind mangrove loss around the world.

Pollution

- **Fertilisers, pesticides, and other toxic man-made chemicals carried by river systems** from sources upstream can kill animals living in mangrove forests, while oil pollution can smother mangrove roots and suffocate the trees.

Fire

- **Fire may have caused some of the most serious damage of the mangrove ecosystem in recent years.** Trees in an area around one km at **Napitkhali under Chandpai range of the world's largest mangrove forests are burning rapidly.**

Climate change

- Mangrove forests require **stable sea levels for long-term survival. They are therefore extremely sensitive to current rising sea levels caused by global warming and climate change.**

Management Failure

- The mangrove forest is disappearing because of the **three main management failure reasons:** lack of skilled and well-trained officials and failure of institutions and conflicting activities, poor planning and knowledge of coastal land use and implementation of the development plan that does not include environmental protection principles. This has resulted in the depletion of Mangroves.

Other Causes

- Other causes behind mangrove forest deterioration are loss of soil fertility, geomorphological changes, high salinity ecological succession, inadequate regeneration and low yield.

Importance in Maintaining Coastal Ecology

Marine Fisheries

- Mangroves provide nursery habitat for many wildlife species, including commercial fish and crustaceans, and thus contribute to sustaining the local abundance of fish and shellfish populations.

Ecological Functions

- Mangroves are an intermediate vegetation between land and sea that grow in oxygen deficient waterlogged soils which have Hydrogen Sulfide (H₂S). They perform important ecological functions like nutrient cycling, hydrological regime, coastal protection, fish-fauna production, etc.

Interface

- A mangrove ecosystem is the interface between terrestrial forests and aquatic marine ecosystems.
- The ecosystem includes diversified habitats like mangrove-dominant forests, litter-laden forest floors, mudflats, coral reefs and contiguous water courses such as river estuaries, bays, inter-tidal waters, channels and backwaters.

Ecotone region

- The mangroves show edge effect, which means that they have large species diversity in comparison to marine or terrestrial ecosystem.

Diversity

- Sundarbans in the Gangetic delta with an area of 2.12 lakh hectares (ha) supports 26 plant species of mangrove with a maximum height of more than 10 metres.

Wildlife Habitat

- Mangrove systems support a range of wildlife species including crocodiles, birds, tigers, Deers, monkeys and honey bees. Many animals find shelter either in the roots or branches of mangroves. Mangroves serve as nesting areas, for coastal birds such as brown pelicans and roseate spoonbills. Many migratory species depend on mangroves for part of their seasonal migrations.

Commercial Use

- Mangrove wood is highly valuable as it is **resistant to rot and insects**. This creates a commercial use for these forests by **indigenous coastal communities that rely on this wood to for construction as well as fuel**. It also serves **medicinal purposes and fodder for their livestock**.

Ecological Niche

- The structural complexities of mangrove vegetation create **unique environments which provide ecological niches for a wide variety of organisms**.

Coastal shields

- Mangroves **give protection to the coastline** and minimise disasters due to cyclones and tsunami.

Shock Absorber

- Mangroves act as shock absorbers. They reduce **high tides and waves and help prevent soil erosion**.

Carbon Sequestration

- Research shows that **mangroves play a key role in carbon sequestration - removing about 1,000 tonnes of carbon per hectare - over thousands of years**.

Encourage Tourism

- Sustainable tourism offers a stimulus to preserve existing mangrove areas, with potential to generate income for local inhabitants.

Way Forward

- Strict enforcement of the **legislative measures, scientific management practices** are very much essential for conservation and sustainable management of the precious mangrove forests.
- **Suitable sites** are to be identified for planting mangrove species.
- Mangrove nursery banks should be developed for propagation purposes.
- **Environmental monitoring** in the existing mangrove areas should be taken up **systematically and periodically**.
- The **participation of the local community should be made compulsory** for conservation and management.

- Floristic survey of mangroves along the coast is to be taken up to prepare biodiversity atlas for mangroves.
- Potential areas are to be identified for implementing the management action plan for mangroves, especially in cyclone prone areas.
- Socioeconomic studies on the mangrove-dependent people need to be taken up to involve them in management of mangrove biodiversity.
- Coastal industries and private owners need to be persuaded to actively participate in protecting and developing mangrove biodiversity.
- The forest department officials should be trained on taxonomy, biology and ecology of mangrove species.
- Agro-forestry along the periphery of mangroves in the wastelands can be taken up for providing alternate fodder to the cattle of nearby villages.
- Alternative livelihood and income generation options like dairy farming, bee keeping, palm candy production, coconut leaf thatching, dry fish marketing, small provisional shops, vegetable shops, etc, can be taken up by the mangrove-dependent communities
- The traditional rights of coastal communities to use the natural resources in their surrounding natural habitats for their livelihood should be recognised while formulating and implementing regulations and conservation measures on priority basis.

Conclusion

- Therefore, while mangrove forests play a major role with more valuable ecological services, scientific management of the same is the need of the hour not only for the wellbeing of the mankind but also for coastal biodiversity.