Mangrove Forests

Introduction

- **About:**
  - A **Mangrove** is a small tree or shrub that grows along coastlines, taking root in salty sediments, often underwater.
  - The word **'mangrove'** may refer to the habitat as a whole or to the trees and shrubs in the mangrove swamp.
  - Mangroves are flowering trees, belonging to the families Rhizophoraceae, Acanthaceae, Lythraceae, Combretaceae, and Arecaceae.
- **Features of Mangroves:**
  - **Saline environment:** They can survive under extreme hostile environments such as high salt and low oxygen conditions.
  - **Low oxygen:** Underground tissue of any plant needs oxygen for respiration. But in a mangrove environment, the oxygen in soil is limited or nil.
    - Hence the mangrove root system absorbs oxygen from the atmosphere.
    - Mangroves have special roots for this purpose called breathing roots or **pneumatophores.**
    - These roots have numerous pores through which oxygen enters the underground tissues.
  - **Survival in Extreme Conditions:** With their roots submerged in water, mangrove trees **thrive in hot, muddy, salty conditions** that would quickly kill most plants.
  - **Succulent leaves:** Mangroves, like desert plants, store fresh water in thick succulent leaves.

    A waxy coating on the leaves seals in water and minimises evaporation.
  - **Viviparous:** Their seeds germinate while still attached to the parent tree. Once germinated, the seedling grows into a propagule.

    The mature propagule then drops into the water and gets transported to a different spot, eventually taking root in a solid ground.

- **Geographical Location:**
  - Mangroves are **found only along sheltered coastlines within the tropical or subtropical latitudes** because they **cannot withstand freezing temperatures.**
  - They share the **unique capability of growing within reach of the tides in salty soil.**

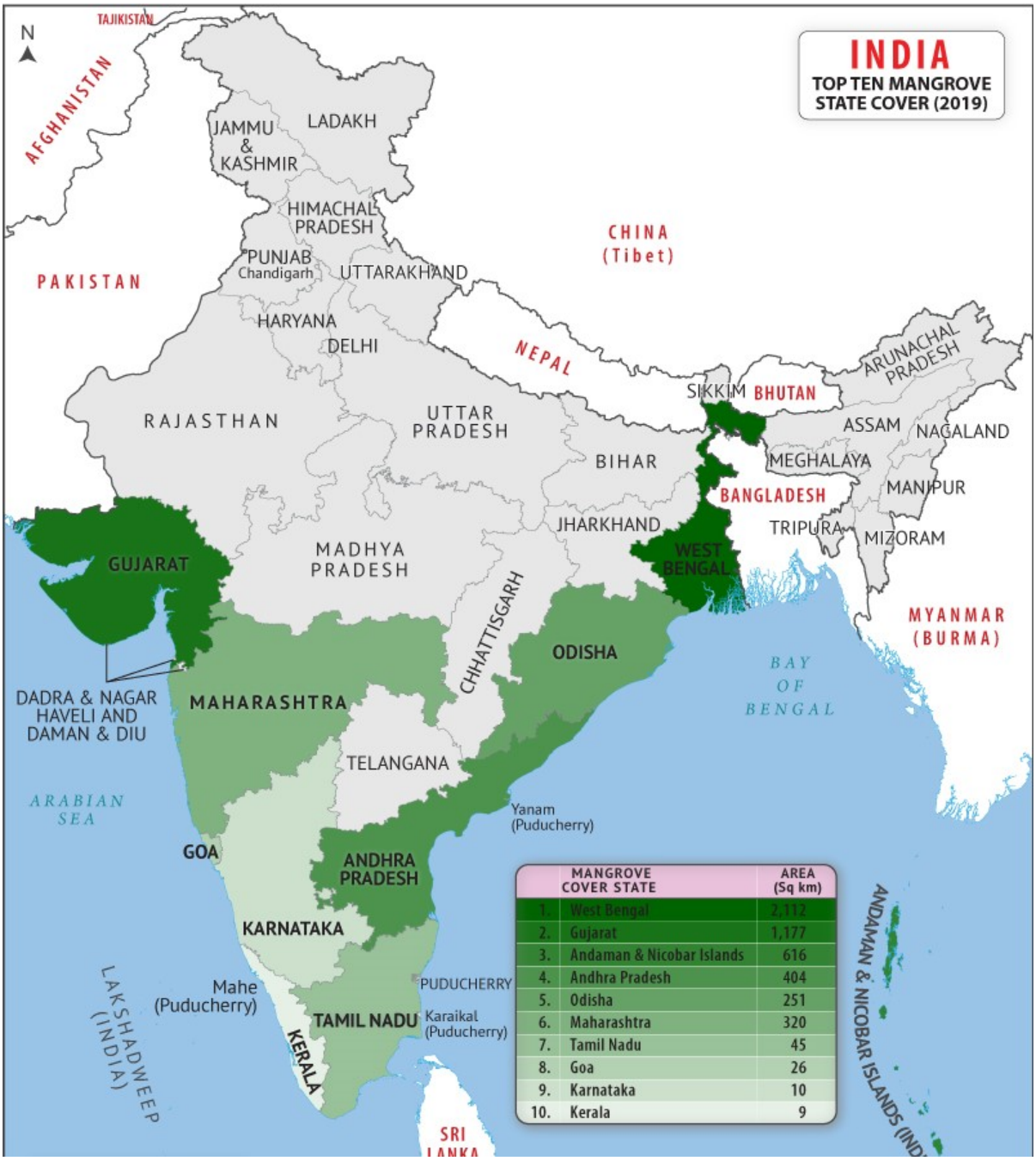
Area Covered

- **Global Mangrove Cover:**
  - The total mangrove cover in the world is one 1,50,000 sq kms.
  - **Asia has the largest number of mangroves worldwide.**

    South Asia comprises 6.8% of the world's mangrove cover.

    India's contribution is 45.8% total mangrove cover in South Asia.

- **Mangroves in India:**
    - **Coverage:** According to the **India State of Forest Report, 2019,** the mangrove cover in India is 4,975 sq km, which is 0.15% of the country's total geographical area.
        - West Bengal has the highest percentage of area under total Mangrove cover followed by Gujarat and Andaman Nicobar Islands.
    - **Largest Mangrove Forest: Sundarbans** in West Bengal are the largest mangrove forest regions in the world. It is listed as a **UNESCO World Heritage Site.**
        - The forest is home to the **Royal Bengal tiger**, **Gangetic dolphins** and **Estuarine crocodiles.**
    - **Bhitarkanika Mangroves:** The second largest mangrove forest in India is **Bhitarkanika** in Odisha created by the two river deltas of River Brahmani and Baitarani.
        - It is one of the most significant **Ramsar wetlands** in India.
    - **Godavari-Krishna Mangroves, Andhra Pradesh:** The **Godavari-Krishna mangroves** extend from Odisha to Tamil Nadu.
    - The deltas of the **Ganges**, **Mahanadi**, **Krishna**, **Godavari**, and the **Cauvery** rivers contain mangrove forests.
    - The **backwaters** in **Kerala** have a high density of mangrove forest.
    - **Pichavaram in Tamil Nadu** has a vast expanse of water covered with mangrove forests. It is home to many aquatic bird species.
    - **West Bengal** has 42.45% of India's mangrove cover, followed by **Gujarat** 23.66% and **A&N Islands** 12.39%.



Significance of Mangroves

- **Ecological Stabilisation:** Ecologically mangroves are important in **maintaining and building the soil,** as a reservoir in the tertiary assimilation of waste.
    - They provide **protection against cyclones.**
    - They play a significant role in promoting land accretion, fixation of mud banks, dissipation of winds, tidal and wave energy.
- **Mangroves and Tides:** The dense tangle of roots allows the trees to handle the daily rise and fall of tides.

    Most mangroves get flooded at least twice per day.

- **Coastal Stabilisation:** Mangrove forests stabilize the coastline, **reducing erosion from storm surges, currents, waves, and tides.**
- **Water Purification:** Mangroves improve the water quality by absorbing nutrients from runoff that might otherwise cause **harmful algal blooms** offshore.
    Both **coral reefs** and seagrass beds rely on the water purifying ability of mangrove forests to keep the water clear and healthy.
- **Storing Blue Carbon:** Mangroves make up less than 2% of marine environments but account for 10-15% of carbon burial.
    - Once the leaves and older trees die they fall to the seafloor and **take the stored carbon with them to be buried in the soil.**
    - This buried carbon is known as **"blue carbon"** because it is stored underwater in coastal ecosystems like mangrove forests, seagrass beds and salt marshes.
- **Supporting Biodiversity:** The mangrove ecosystem also supports an incredible diversity of creatures including some **species unique to mangrove forests.**
    They provide habitat and refuge to a wide array of wildlife such as birds, fish, invertebrates, mammals and plants.

Threats Faced by Mangroves

- **Commercialisation of Coastal Areas: Aquaculture, coastal development, rice and palm oil farming and industrial activities** are rapidly replacing these salt-tolerant trees and the ecosystems they support.
    According to **UNESCO**, mangroves are **disappearing at three to five times faster rate** than overall losses of global forest cover in the face of infrastructure development, urbanisation and agricultural land conversion.
        Mangrove coverage has shrunk by half in the last 40 years. Less than 1% of tropical forests are mangroves.
- **Shrimp Farms:** The emergence of shrimp farms have caused at least 35% of the overall loss of mangrove forests.
    The rise of shrimp farming is a response to the increasing appetite for shrimp in the United States, Europe, Japan and China in recent decades.
- **Temperature Related Issues:** A fluctuation of **ten degrees in a short period of time is enough stress to damage the plant** and freezing temperatures for even a few hours can kill some mangrove species.
- **Soil Related Issues:** The soil where mangroves are rooted poses a challenge for plants as it is severely lacking in oxygen.
    Most plants can easily take oxygen from gases trapped within the surrounding soil, but for mangrove roots this is not an option as not only their roots underground, they are also flooded with water up to two times a day.
- **Excessive Human Intervention:** During past changes in sea level, mangroves were able to move further inland, but in many places **human development is now a barrier that limits how far a mangrove forest can migrate.**
    Mangroves also frequently suffer from oil spills.

Conservation of Mangroves

- **UNESCO Designated Sites:** The inclusion of mangroves in **Biosphere Reserves**, World Heritage sites and **UNESCO Global Geoparks** contributes to **improving the knowledge, management and conservation of mangrove ecosystems** throughout the world.
- **International Society for Mangrove Ecosystem (ISME):** The ISME is a non-governmental organization established in 1990 to **promote the study of mangroves with the purpose of enhancing their conservation,** rational management and sustainable utilization.
- **Blue Carbon Initiative:** The International Blue Carbon Initiative is focused on mitigating climate change through the **conservation and restoration of coastal and marine ecosystems.**
    - It is coordinated by Conservation International (CI), **IUCN**, and the **Intergovernmental Oceanographic Commission-UNESCO** (IOC-UNESCO).
- **International Day for the Conservation of the Mangrove Ecosystem:** UNESCO celebrates this day on July 26 with the aim of **raising awareness about mangrove ecosystems** and to promote their sustainable management and conservation.
- **Mangroves for the Future Initiative:** IUCN and UNDP developed a unique initiative to promote investment in coastal ecosystem conservation called the “Mangroves for the Future (MFF)”.
    - The member nations include Bangladesh, Cambodia, **India**, Indonesia, Maldives, Myanmar, Pakistan, Seychelles, Sri Lanka, Thailand, and Vietnam.
- **National Mangrove Committee:** The Government of India set up a **National Mangrove Committee in 1976** which **advises the government** about conservation and development of mangroves.