



## Mangroves in India

**For Prelims:** [Mangroves](#), [Indian State Forest Report 2023](#), [Sundarbans](#), [MISHTI \(Mangrove Initiative for Shoreline Habitats & Tangible Incomes\)](#), [Sustainable Aquaculture In Mangrove Ecosystem \(SAIME\) initiative](#).

**For Mains:** Significance of Mangroves, Challenges Related to Mangroves in India

[Source: TH](#)

### Why in News?

A recent report by Anna University highlights Tamil Nadu's significant mangrove expansion, **doubling from 4,500 hectares in 2021 to 9,039 hectares in 2024**, bringing mangroves into the discussion.

### What are Mangroves?

- **About:**

- **Mangroves** are **coastal ecosystems** composed of **salt-tolerant trees and shrubs** that thrive in **intertidal zones of tropical and subtropical regions**.
- They are uniquely **adapted to survive in saline, low-oxygen environments** with slow-moving waters, where **fine sediments tend to accumulate**.
- Some common mangrove trees include **Red mangrove, Grey mangrove, and Rhizophora**.

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# MANGROVES

\*Diverse group of salt-tolerant plant communities found in the (tropical/subtropical) coastal intertidal zone\*

## CHARACTERISTICS ↴

- Survive under **hostile environments** (high salt, low oxygen)
- Their roots (**pneumatophores**) absorb oxygen from atmosphere
- Thick **succulent leaves** to store fresh water

## MANGROVE COVER ↴

- Global:** Asia > Africa > North and Central America > S America
- India (ISFR 2021):** West Bengal > Gujarat > A&N Islands > Andhra Pradesh > Maharashtra

**Sunderbans - World's largest single patch of Mangrove forests**

## SIGNIFICANCE ↴

- Stabilise the coastline** and reduce soil erosion
- Protection against **cyclones**
- Improve water quality** by absorbing nutrients
- Important **carbon sink**

## THREATS ↴

- Commercialisation** of coastal areas
- Emergence of **shrimp farms**
- Temperature fluctuations** (Mangroves can't survive freezing temperatures)

## CONSERVATION MEASURES

### Global

- Inclusion of Mangroves** in Biosphere Reserves and UNESCO Global Geoparks
- Mangroves for the Future Initiative** (IUCN & UNDP)
- Mangrove Alliance for Climate** (UNFCCC COP27)

### India

- National Mangrove Committee** (1976)
- Mangrove Initiative for Shoreline Habitats & Tangible Incomes (MISHTI)** (Union Budget 2023-24)

**International Day for Conservation of the Mangrove Ecosystem - July 26 (UNESCO)**



### Key Characteristics:

- Habitat & Growth Conditions:** Mangroves thrive in **tidal flats, estuaries, and deltas with high silt deposition**, experiencing **bi-daily tidal flooding**.
  - They adapt to **high solar radiation, anaerobic mud**, and can **extract freshwater from saline water**.
- Physiological Adaptations:** They develop **pneumatophores** (*Avicennia*) for respiration, **prop roots** (*Rhizophora*) for stability, and **lenticellated bark** for water loss and salt secretion.
  - Their **salt-secreting glands** aid salt excretion, while roots trap sediments and stabilize coastlines.
- Reproductive Adaptations:** Mangroves exhibit **viviparity**, where seeds germinate on the tree before falling, ensuring survival in saline conditions.


### Mangroves Distribution: Mangroves thrive only in **tropical and subtropical latitudes** near the equator, as they **cannot withstand freezing temperatures**.

- As per FAO (2023), the **global mangrove extent** in 2020 was **14.8 million hectares**, covering **less than 1% of all tropical forests globally**.
- Largest mangrove areas are in **South and Southeast Asia**, followed by **South America, Africa, North and Central America, and Oceania**.

- **Indonesia, Brazil, Nigeria, Mexico, and Australia** hold **47%** of the global mangrove cover.

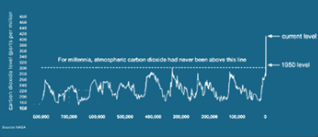
# Carbon Pricing Explained

**Carbon Pricing** is a market-based approach of putting a price on carbon emissions to shift the cost of pollution onto industry emitters.




Currently, polluters pollute for free and the public bears the many associated costs.

## The Current Costs of Emissions




Human-caused emissions have led CO2 levels to surge to **415 ppm**, the highest they have been in roughly 4 million years.


The costs of emissions will likely continue growing if the status quo is maintained. A carbon price requires industry to reduce those environmental, economic, and health costs to the public.




**Improved Public Health**




**Public Investments**



**Backed by Businesses**



**Clean Energy Solutions**



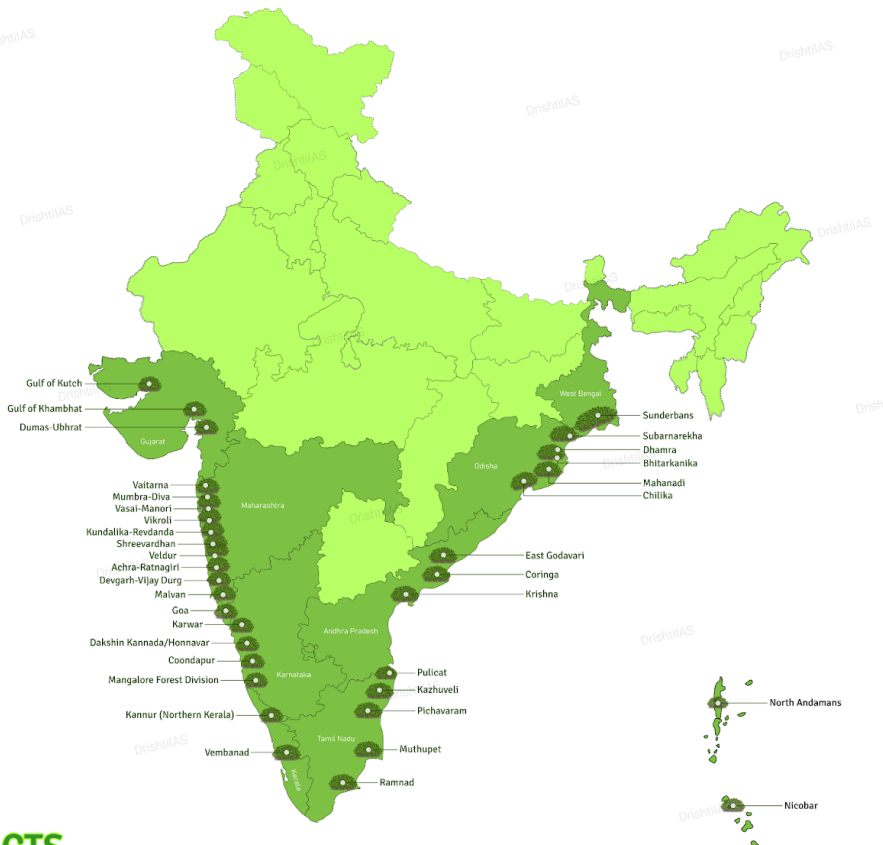
**Emission Reductions**

Emissions create **poor air quality**, which leads to an estimated **107,000 Deaths per Year** in the U.S. that affect **communities of color** at a disproportionate rate.

An estimated **\$886 billion per year** is spent on the **health impacts** caused by air pollution in the U.S.

- **Mangroves Cover in India:** As per the [Indian State of Forest Report \(ISFR\) 2023](#), India's **mangrove cover** is around **4,992 sq. km**, constituting **0.15%** of the country's total geographical area.
  - Major mangrove ecosystems are found in **Odisha (Bhitarkanika), Andhra Pradesh (Godavari-Krishna delta), Gujarat, Kerala, and the Andaman Islands.**
  - The **Sundarbans** is the **largest contiguous mangrove forest in the world**, while **Bhitarkanika** is the **second largest in India.**

# MANGROVES IN INDIA



## FACTS

- \* UNESCO observes **July 26** as the **International Day for the Conservation of the Mangrove Ecosystem**.
- \* As per ISFR 2021, the mangrove cover in India is 4,992 sq km, which is **0.15% of the country's total geographical area**.
- \* **West Bengal>Gujarat>A&N Islands>Andhra Pradesh>Maharashtra**, have the largest Mangrove cover in India (ISFR 2021).
- \* In India, mangroves are protected by the **Environmental (Protection) Act 1986** and Coastal Zone Regulations.
- \* **Sunderbans**, a **UNESCO World Heritage Site**, is the **world's largest single patch of Mangrove Forests**.
- \* Sunderbans is the first Mangrove forest in the world, which was brought under scientific management, as early as in 1892.
- \* The emergence of **shrimp farms** is responsible for at least **35% of the overall loss of mangrove forests**.

## Sundarbans

- The **Sundarbans** is named after the **sundari tree (*Heritiera fomes*)**.
- It extends from the **Hooghly River in West Bengal, India, to the Baleswar River in Bangladesh**, covering the **Ganges, Brahmaputra, and Meghna delta**.
- Four protected areas-**Sundarbans National Park (India), Sundarbans West, Sundarbans South, and Sundarbans East Wildlife Sanctuaries (Bangladesh)** are designated as **UNESCO World Heritage Sites**.
- The region hosts **rich biodiversity**, including **260 bird species, the Bengal tiger, estuarine crocodile, and Indian python**, among other threatened species.





Spanning across India and Bangladesh, Sundarbans is amongst the world's largest contiguous blocks of mangrove forest. Less than 40 percent of Sundarbans is located in India and the rest is in Bangladesh. On the Indian side, forest boundaries have changed very little since 1943.

## What is the Significance of Mangroves?

- **Carbon Sequestration:** Mangroves store an average of **394 tonnes of carbon per hectare**. Their unique **anaerobic and saline conditions slow decomposition**, making them **highly effective blue carbon sinks**..
- **Coastal Protection:** Mangroves act as **natural barriers against storm surges, tsunamis, and coastal erosion**, reducing **wave energy by 5-35%**.
  - They lower **flood depths by 15-20%** and up to **70% in certain areas**, playing a crucial role in **disaster risk reduction**.
- **Biodiversity Hotspots:** They support **5,700+ species across 21 phyla in India**, including Bengal tigers, estuarine crocodiles, Indian pythons, and 260+ bird species.
- **Food Security and Livelihoods:** Mangroves support global fisheries by nurturing **800 billion aquatic species annually** and provide **honey, fruits, and leaves**, sustaining coastal communities.

## Mangroves provide a variety of benefits including:

### 1 Biodiversity Hotspots



Mangroves are home to an incredible array of species, providing habitat for fish, sharks, rays, sea turtles, and birds. An estimated 80% of the global fish catch relies on mangrove forests either directly or indirectly.

### 2 Livelihoods



The fisher communities we work with depend on their natural environment to provide for their families. **Healthy mangrove ecosystems mean healthy fisheries**.

### 3 Water Filtration



Mangroves are vital to maintain seawater quality. They retain flowing sediments, and can trap pollutants, protecting connected habitats such as coral reefs and seagrass beds.

### 4 Landmass builders



The dense network of roots and surrounding vegetation which trap sediment prevents erosion and can buildup coastlines and cays over time.

### 5 Fighting climate change



Mangroves extract carbon from the atmosphere at a higher rate than tropical forests, and can store up to **5 times** more carbon per acre in their soils.

### 6 Economy



Many coastal communities rely on mangroves for their economic benefits, especially in the fisheries and tourism sectors. Mangroves also reduce costly damages from hurricanes by providing protection against wave action and storm surges.

## What are the Major Threats to Mangroves?

- **Land Conversion:** According to the "**State of the World's Mangroves 2024**" report, **aquaculture (26%), along with oil palm plantations** and rice cultivation (43%), has been a **major driver of mangrove loss between 2000 and 2020**.
  - **Timber extraction** and **charcoal production** lead to severe mangrove degradation.
- **Pollution: Oil spills**, particularly in areas like the **Niger Delta**, threaten mangrove regeneration and ecosystem health.
- **Invasive Species:** The spread of ***Prosopis juliflora***, an aggressive invasive species found in the mangroves of Tamil Nadu and Sri Lanka, **disrupts mangrove ecosystems** by **outcompeting native species**, altering soil salinity, reducing freshwater availability, and hindering regeneration.



# Threats to Mangroves

Around the world, mangroves are faced with many challenges. Below, we outline some of the threats to mangrove wetlands.

## Natural Disasters



Hurricanes and tsunamis are a major threat to mangroves. Strong winds and large waves can damage and uproot trees while some storms can wipe out entire forests. This can then lead to changes in hydrology and increase the risk of erosion from storm surge.

## Climate Change



Rising sea levels, higher temperatures and changes in weather patterns all have an effect on mangroves. With current global sea level rise at a rate of around 4mm per year, coastal mangroves are being forced further inland. An increase in more powerful hurricanes and longer droughts are also some ways climate change is threatening mangroves.

## Deforestation



Deforestation is just as big of a threat to coastal forests as it is to tropical and dry forests. In addition to clearing the trees for land use, many places use the trunks of mangroves as timber to build homes, some also use the tannins from the red mangrove bark as dye for clothing and leather.

## Aquaculture



The construction of coastal farms, like shrimp farms, can damage mangrove trees and interfere with the hydrology to the rest of the forest. Many farms use pesticides and chemicals which can pollute the surrounding area and lead to eutrophication. This can then have a negative impact on the biodiversity of the ecosystem.

## Coastal Development



Developing coastal areas does not only destroy mangroves and the habitat they create, but it also disturbs the sediment which stores large amounts of carbon dioxide. Mangrove forests are carbon sinks that absorb and store carbon dioxide, helping to reduce the effects of climate change. When the sediment is disturbed, this stored carbon is re-released into the atmosphere.

## Pollution



Pollution of all kinds can be harmful to mangroves. Plastic pollution can become caught in the trees and their roots, entangling or suffocating marine life and birds. Water pollution is also a major threat to mangroves as contaminated water can poison the tree.



Read More: [What are India's Initiatives Related to Mangroves Conservation?](#)

## Way Forward

- **Strengthening Legal Framework:** Enforce stricter laws and regulatory measures to curb deforestation, pollution, and unsustainable coastal development.
- **Community Participation:** Engage local communities in conservation initiatives and provide sustainable livelihood opportunities linked to mangrove protection such as "adopt" mangrove areas, ensuring their maintenance, protection, and restoration.
- **Research & Technology Adoption:** Invest in research for [phytoremediation](#), medicinal applications, and sustainable mangrove uses.
  - Utilize **drone monitoring** and [Artificial Intelligence \(AI\)](#) for real-time surveillance and protection against illegal activities.
- **Bio-Restoration:** Implement **bio-restoration techniques** to rehabilitate degraded mangrove areas, ensuring species diversity to enhance resilience against climate change.
- **Sustainable Coastal Development:** Promote **eco-friendly infrastructure, regulate aquaculture, and integrate mangrove conservation into urban planning.**
- **International Collaboration:** Strengthen **global cooperation through agreements** like the [Ramsar Convention](#) and the [Blue Carbon Initiative](#) for effective mangrove conservation strategies.

### **Drishti Mains Question:**

Examine the ecological and economic importance of mangroves in India. Suggest a holistic strategy for their conservation and sustainable management.

## UPSC Civil Services Examination Previous Year Question (PYQ)

### Prelims

**Q. Which one of the following regions of India has a combination of mangrove forest, evergreen forest and deciduous forest? (2015)**

- (a) North Coastal Andhra Pradesh
- (b) South-West Bengal
- (c) Southern Saurashtra
- (d) Andaman and Nicobar Islands

**Ans: (d)**

### Mains

**Q. Discuss the causes of depletion of mangroves and explain their importance in maintaining coastal ecology. (2019)**

PDF Reference URL: <https://www.drishtiias.com/printpdf/mangroves-in-india-2>

