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Q18

The Intergovernmental Panel on Climate Change (IPCC) has predicted a global sea level rise of about one metre by AD 2100. What would be its impact in India and the other countries in the Indian Ocean region?

UPSC Civil Services Mains 2023 · GS III · 15 marks · Environment and Conservation

Conservation, environmental pollution and degradation, environmental impact assessment.

Core demand of the question

- Take the IPCC picture of about one metre of global sea-level rise by 2100
- State impacts on India and on other countries of the Indian Ocean region

Revision summary

IPCC high-end paths put global sea-level rise near one metre by 2100; lower paths are smaller but still damaging.

A higher mean sea lifts every tide and **cyclone surge** and pushes salt into aquifers.

India's deltas, **Sundarbans**, and coastal megacities would flood more often; islands have little retreat space.

Bangladesh and the **Maldives** are among the most exposed Indian Ocean neighbours.

Adaptation is mangroves, setbacks, and planned retreat, plus global emission cuts.

Introduction

The **Intergovernmental Panel on Climate Change (IPCC)** projects that, in a high-warming path, **global mean sea level** could approach about **one metre** by **2100** (lower paths give a smaller rise; ice-sheet uncertainty cuts both ways). For India and its ocean neighbours this is not a distant tide table. It is **saline fields, drowned mangroves, and cities already at the storm line**.

Body**What a one-metre rise does physically**

- Higher **mean sea level** raises every high tide and every storm surge.
- **Saltwater** moves up estuaries and into coastal aquifers.
- Beaches and deltas **erode**; mangroves drown if they cannot retreat inland.
- Groundwater in coastal cities becomes brackish; drainage fails because the outfall is under water.

Impact on India

- **The Ganga-Brahmaputra-Meghna and Mahanadi, Godavari, Krishna, Cauvery deltas:** loss of farmland, homestead, and **Sundarbans**-type mangrove; climate refugees inside the country.

- **Mumbai, Chennai, Kochi, Visakhapatnam, Kolkata** and other low wards: more frequent tidal flooding, stalled suburban rail, and port downtime.
- **Gujarat and Odisha** cyclone coasts: the same cyclone then rides a higher base sea, so the surge travels further inland.
- **Lakshadweep** and parts of the **Andaman and Nicobar** coasts: limited high ground; coral atolls are in the same class of risk as other small islands.
- Fisheries, salt pans, and **naval and commercial harbours** face chronic inundation and corrosion costs.
- **Adaptation:** mangrove buffers, building setbacks, storm-surge shelters, and **managed retreat** in the worst pockets - cheaper if started before the metre arrives.

Indian Ocean region

- **Bangladesh:** a large share of the nation is delta; one metre is an existential development shock, with spillover migration.
- **Maldives:** atoll nation whose average elevation is only a couple of metres; one metre threatens habitability of many islands.
- **Sri Lanka, Myanmar, Indonesia, eastern Africa (Kenya, Tanzania, Mozambique):** port cities, tourism beaches, and fishing villages.
- **Small island developing States** in the wider basin lose freshwater lenses first, then land.
- Shared Indian Ocean warming and **cyclone** intensity compound the slow rise. Regional cooperation on data, mangroves, and loss-and-damage finance is therefore a security and a climate issue, not only an environment footnote.

Flow diagram

IPCC about 1m by 2100 -> Higher tide and surge
 Higher tide and surge -> India deltas and cities
 Higher tide and surge -> Bangladesh Maldives islands
 India deltas and cities -> Salt farms migration ports
 Bangladesh Maldives islands -> Salt farms migration ports

Conclusion

An IPCC-scale rise near one metre by 2100 would salt India's deltas, flood coastal megacities, and shrink island ground. Bangladesh and the **Maldives** face still sharper loss. The response is cut emissions, protect mangroves, and plan retreat where a wall will not hold.

Facts & figures

IPCC AR6

Global mean sea level in 2100 spans roughly a few tens of centimetres to around one metre depending on emissions and ice-sheet response.

Sundarbans

Shared India-Bangladesh mangrove; sea-level rise plus reduced sediment already stresses the islands.

Maldives

Atoll State with very low average elevation; freshwater lenses fail before full inundation.

Mumbai and Chennai

Large populations on reclaimed or low coastal land; tidal flooding is already a present problem.

Cyclone surge

A higher base sea level lets the same storm push water further inland on Odisha, Andhra, Bengal and Gujarat coasts.

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