

GOVERNMENT OF INDIA  
MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE

**LOK SABHA**  
**UNSTARRED QUESTION NO. 1479**  
TO BE ANSWERED ON 09.02.2026

**Climate Induced Changes on Coastal Settlements**

1479. SMT. SUPRIYA SULE:

SHRI SANJAY DINA PATIL:

PROF. VARSHA EKNATH GAIKWAD:

SHRI BHASKAR MURLIDHAR BHAGARE:

DR. AMOL RAMSING KOLHE:

SHRI MOHITE PATIL DHAIRYASHEEL RAJSINH:

Will the Minister of ENVIRONMENT, FOREST AND CLIMATE CHANGE be pleased to state:

- (a) whether the Government has conducted any comprehensive scientific studies to evaluate the impact of rising sea levels, coastal erosion and climate-induced changes on coastal settlements across the country, particularly along the Maharashtra coastline;
- (b) if so, the details and key findings of such assessments in respect of Maharashtra;
- (c) whether the Government has identified the districts, towns and villages in Maharashtra such as Mumbai, Raigad, Ratnagiri and Sindhudurg that are most vulnerable to sea-level rise and extreme weather events and if so, the details thereof;
- (d) whether Government has formulated or implemented any adaptation and mitigation measures such as coastal protection infrastructure, mangrove restoration and early warning systems to safeguard life, property and livelihood of residents in these high-risk coastal areas and if so, details thereof; and
- (e) whether the Government proposes to launch or expand any new initiatives in Maharashtra for long-term monitoring, sustainable coastal planning and community-based climate resilience to address the challenges posed by sea-level rise and if so, the details thereof?

**ANSWER**

MINISTER OF STATE IN THE MINISTRY OF ENVIRONMENT, FOREST AND  
CLIMATE CHANGE  
(SHRI KIRTI VARDHAN SINGH)

(a) to (c): The Government has undertaken the following scientific studies to assess the impacts of sea-level rise, coastal erosion, and climate-induced changes on coastal settlements across the country:

- i. The Indian National Centre for Ocean Information Services (INCOIS), an autonomous institute under the Ministry of Earth Sciences (MoES), has prepared the report “Projected Changes in Extreme Sea Levels and Coastal Vulnerability along the Indian Coasts” under the Deep Ocean Mission. The study provides a comprehensive assessment of projected sea-level rise, its implications for coastal India, and associated coastal vulnerability maps.
- ii. Indian National Centre for Ocean Information Services (INCOIS) has developed a Coastal Vulnerability Index (CVI) for the entire Indian coastline as part of the Tsunami Early Warning System. The CVI, mapped at a scale of 1:100,000, is based on multiple parameters including sea-level rise, coastal slope, shoreline change rate, elevation, geomorphology, tidal range, and significant wave height.

- iii. INCOIS has also carried out Coastal Multi-Hazard Vulnerability Mapping (MHVM) for the entire Indian coastline at a scale of 1:25,000, using parameters such as sea-level change, shoreline change rate, elevation contours, extreme water levels from tide gauges, and return periods.
- iv. The National Centre for Coastal Research (NCCR), an attached office of MoES, has been monitoring shoreline changes along the Indian coast since 1990 using remote sensing data supported by field verification. NCCR has prepared 526 coastal erosion maps at a scale of 1:25,000, along with district-wise and State/UT-wise maps. For the Maharashtra coast (1990–2022), the study indicates that 27.7% of the coastline is eroding, 54.7% is stable, and 17.6% is experiencing accretion. The district-wise shoreline change status and identified erosion hotspot regions along the Maharashtra coast have also been documented as part of the study for 1990-2022. The district wise details of erosion is as follows:

District	Coast Length (in km)	Erosion	
		Km	(%)
Sindhudurg	144.66	19.02	13.1
Ratnagiri	264.06	36.18	13.7
Raigad	196.78	64.36	32.7
Mumbai city	67.64	6.52	9.6
Mumbai suburban	40.16	20.72	51.6
Thane	6.86	1.76	25.7
Palghar	113.06	82.26	72.8
<b>Overall</b>	<b>833.22</b>	<b>230.82</b>	<b>27.7</b>

- v. NCCR also undertakes R&D on coastal processes and shoreline management, assists States/UTs in identifying vulnerable stretches, recommends site-specific mitigation measures, and supports preparation of Shoreline Management Plans (SMPs).
  - vi. Under the Coastal Management Information System (CMIS), the Central Water Commission has established two coastal data collection stations in Maharashtra (Tarkarli and Satpati). Since 2019, nine coastal parameters—including waves, ocean currents, bathymetry, sediment dynamics, beach profiles, shoreline change, wind and rainfall, riverine data, and salinity—are being monitored to support coastal planning and management.
  - vii. As informed by Government of Maharashtra (GoM), it has undertaken a comprehensive climatological assessment that includes sea-level rise, temperature, rainfall, and other meteorological parameters, through its revised State Action Plan on Climate Change (SAPCC).
  - viii. Further as informed by Government of Maharashtra, steps have been undertaken for preparation of the Coastal Zone Management Plan under Coastal Regulation Zone (CRZ) Notification 2019, Shoreline Change Assessment, and Shoreline Management Plan for the seven coastal districts of Maharashtra—Sindhudurg, Ratnagiri, Raigarh, Greater Mumbai, Mumbai Suburban, Thane, and Palghar—and include analysis of coastal erosion and sea-level rise projections.
- (d) Government is implementing the following adaptation and mitigation measures to safeguard life, property and livelihood of residents in these high-risk coastal areas:
- i. “Mangrove Initiative for Shoreline Habitats & Tangible Incomes (MISHTI)” was launched as Budget Announcement for FY 2023-24 to restore and promote mangroves as unique, natural eco-system and for preserving and enhancing the sustainability of the coastal habitats, with the objective to “restore mangrove forests” by undertaking mangrove reforestation/ afforestation measures along the coast of India. This programme envisages covering approximately 540 sq km area across nine coastal States and four Union Territories.

- ii. INCOIS functions as the nodal agency for providing ocean-based early warning and advisory services for disaster risk reduction and coastal safety along the entire Indian coastline, including Maharashtra. Its services include tsunami and storm-surge warnings, ocean state advisories on high waves, currents and swell surges, and comprehensive 7-day ocean state forecasts covering major oceanographic parameters.
- iii. INCOIS also provides critical support services such as search and rescue advisories, oil-spill trajectory forecasts, small-vessel advisories, marine heatwave information, and other user-specific ocean services, which are vital for maritime safety, fisheries, coastal infrastructure protection, and environmental management.
- iv. To enhance preparedness and response, INCOIS undertakes regular capacity-building activities including awareness programmes, training workshops, tsunami mock drills, and implementation of the Tsunami Ready programme in coordination with State Governments, UTs, and disaster management agencies.
- v. INCOIS also conducts coordination meetings and joint exercises with stakeholders, and systematically incorporates feedback to strengthen advisory products, dissemination protocols, and operational readiness.
- vi. The Guidelines for Appraisal and Release of Funds for Coastal and River Erosion under the National Disaster Mitigation Fund (NDMF) and the Policy on Resettlement of People Affected by Erosion under the National Disaster Response Fund (NDRF) were issued on 20 June 2024, based on the recommendations of the Fifteenth Finance Commission.
- vii. As per these recommendations, an allocation of ₹1,500 crore has been earmarked under the NDMF for erosion mitigation during 2021–26, and ₹1,000 crore has been provided under the NDRF for resettlement of erosion-affected people. These measures aim to reduce vulnerability, strengthen recovery, and enhance long-term riverbank resilience.

(e) Further, Government of Maharashtra has stated that it has proposed the project “M-SHORE: Strengthening Coastal Resilience and the Economy in the Coastal Districts of Maharashtra” to Department of Economic Affairs, Ministry of Finance, for a period of five years, with the financial assistance from the World Bank. The project aims at sustainable and productive use of coastal and marine resources, strengthening the blue economy, and building coastal resilience through integrated Coastal Zone Management and Shoreline Management Plans and will cover all coastal districts including Palghar, Thane, Greater Mumbai, Mumbai Suburban, Raigad, Ratnagiri and Sindhudurg.

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