GOVERNMENT OF INDIA
MINISTRY OF EARTH SCIENCES
LOK SABHA
UNSTARRED QUESTION NO. 1706
TO BE ANSWERED ON WEDNESDAY, 10th DECEMBER, 2025

VULNERABILITY OF COASTAL REGION TO FLOOD AND SEA LEVEL RISE

1706. **SHRI SHRIRANG APPA CHANDU BARNE:**
SHRI NARESH GANPAT MHASKE:
SHRI RAVINDRA DATTARAM WAIKAR:
DR. SHRIKANT EKNATH SHINDE:

Will the Minister of EARTH SCIENCES be pleased to state:

(a) whether the Government has assessed the vulnerability of coastal homes, towns and infrastructure to flooding and sea-level rise due to climate change, glacial melt and extreme weather events and if so, the details thereof, State/UT-wise;
(b) the steps taken by the Government to strengthen coastal resilience, including construction of flood barriers, embankments, drainage systems and early warning mechanisms in vulnerable coastal areas;
(c) whether the Government has incorporated climate-resilient town planning and building regulations for new coastal developments to prevent recurrent flooding and if so, the details thereof;
(d) the measures undertaken to monitor and mitigate the impact of melting glaciers on river flow, coastal flooding and sedimentation patterns that threaten human settlements; and
(e) whether the Union Government has collaborated with State Governments, local bodies, and scientific institutions to create a disaster-resilient infrastructure plan for coastal towns, including relocation or retrofitting of high-risk homes and if so, the details thereof?

ANSWER
THE MINISTER OF STATE (INDEPENDENT CHARGE) FOR
MINISTRY OF SCIENCES AND TECHNOLOGY
AND EARTH SCIENCES
(DR. JITENDRA SINGH)

(a) Yes Sir. Indian National Centre for Ocean Information Services (INCOIS), an autonomous institute under Ministry of Earth Sciences has carried out Coastal Vulnerability Index (CVI) mapping to assess the probable implications of sea-level rise along the Indian coast. This exercise has generated maps using seven input parameters: shoreline change rate, sea-level change rate, coastal elevation, coastal slope, coastal geomorphology, significant wave height and tidal range. An atlas comprising 156 maps of the entire Indian coast on a 1:1 lakh scale was released in 2012. Further, studies have been done on Multi Hazard Vulnerability Mapping to identify potential areas of coastal inundation for the mainland of India at a 1:25000

scale using data on extreme water levels, coastal erosion, sea-level change and high-resolution topography. In addition, National Centre for Coastal Research (NCCR), an attached office of Ministry of Earth Sciences has undertaken assessment of sea erosion and identified coastal areas along India's coastline subjected to sea erosion since 1990. A report on "National Assessment of Shoreline Changes along Indian Coast" was released in July 2018 and the report was shared with various Central and State Government agencies and stakeholders for implementing shoreline protection measures. An updated version of the Atlas, along with a digital version of the report, containing all the maps, was released on 25th March 2022. The state-wise details of erosion (1990-2018) are given in the below table:

1990 – 2018					
Sl No	**State**		**Coast Length (in km)**	**Coast length (in Km)**	
				Erosion	
				Km	**%**
1	West Coast	Gujarat	1945.6	537.5	27.6
2		Daman & Diu	31.83	11.02	34.6
3		Maharashtra	739.57	188.26	25.5
4		Goa	139.64	26.82	19.2
5		Karnataka	313.02	74.34	23.7
6		Kerala	592.96	275.33	46.4
7	East Coast	Tamil Nadu	991.47	422.94	42.7
8		Puducherry	41.66	23.42	56.2
9		Andhra Pradesh	1027.58	294.89	28.7
10		Odisha	549.5	140.72	25.6
11		West Bengal	534.35	323.07	60.5
Total			6907.18	2318.31	
%				**33.6**	

(b) & (c) The Flood Management Scheme of Ministry of Jal Shakti, including anti-sea erosion schemes, are planned and executed by the State Governments with their own resources as per priorities of States. Union Government provides assistance to states which is technical, advisory, catalytic and promotional in nature.

Ministry of Environment, Forest & Climate Change (MoEF&CC) in association with Survey of India (SOI) has delineated the hazard line for the entire coast of the country. The hazard line is indicative of the shoreline changes, including sea level rise due to climate change. This line is to be used by agencies in Coastal States as a tool for Disaster Management including planning of adaptive and mitigation measures. The hazard line features in the new Coastal Zone Management Plans (CZMP) of the coastal States/Union territories approved by the MoEF&CC.

MoEF&CC has notified Coastal Regulation Zone (CRZ) Notification, 2019 with a view to conserve and protect coastal stretches, marine areas and to ensure livelihood security to the fisher and other local communities. The coastal regulations, however, permit setting up of erosion control measures in the coast. The notification also provides for No Development Zones (NDZ) along various categories of coastal areas to protect India's coastline from encroachment and erosion.

To strengthen the structural measures of flood management, Ministry of Jal Sakthi had implemented during XI & XII Plan Flood Management Programme (FMP) for providing Central Assistance to States for works related to river management, flood control, anti-erosion, drainage development, anti- sea erosion, etc. which subsequently continued as a component of "Flood Management and Border Areas Programme" (FMBAP) for the period from 2017-18 to 2020-21 and further extended up to September 2022 with limited outlay. The Union Cabinet has approved "Flood Management and Border Areas Programme (FMBAP)" with total outlay of Rs. 4,100 crore (FMP-Rs 2923.56 Cr) for a period of 5 years from 2021-22 to 2025-26.

As a non-structural measure of flood management, Central Water Commission (CWC) issues short-range flood forecasts with a lead time up to 24 hrs to concerned State Governments at identified locations. CWC also issues inflow forecasts to identified reservoirs for proper reservoir regulation. Presently, flood forecasts are issued by CWC at 350 stations (150 Inflow Forecast Stations + 200 Level Forecast Stations) as per Standard Operating Procedure. The network has been established in consultation with State Govt./Project authorities.

CWC is currently providing seven-day advisory flood forecast on its web portal https://aff.india- water.gov.in/ through pan India 1D rainfall-based mathematical modeling for major river basins of the country, covering 200 water levels and 150 reservoir inflow forecast stations. CWC adopts various dissemination mechanisms to get maximum reach to the flood warnings produced, so that mitigation measures can be adopted by State Governments, SDMA, NDMA and public. The flood forecasts formulated by CWC are disseminated to all stakeholders through Flood Forecasting Website (https://ffs.india- water.gov.in/)/ FloodWatch India 2.0 App/ E-mail/Whatsapp/ facebook (CWCOfficial. FF) /X (Twitter- CWCOfficial FF), 'CWC Flood updates' (Youtube Channel), Common Alert Protocol (CAP) Alert through NDMA Sachet portal.

Further steps to strengthen coastal resilience, including construction of flood barriers, embankments, drainage systems, incorporation of climate resilient town planning etc are planned and executed by respective Maritime States/ UTs. Such projects are generally funded by States/ UTs from their own fund or from multilateral funding or through Central Assistance. There is provision for central assistance for critical sea erosion works under Flood Management and Border Area Programme (FMBAP) scheme as per Guidelines of Ministry of Jal Shakti.

The Government has also released the "Reference Manual on Climate Change Adaptation Guidelines for Coastal Protection and Management in India" in March 2019. The guidelines were developed under the Asian Development Bank (ADB) technical assistance on 'Climate Resilient Coastal Protection and Management Project' (CRCPMP). These guidelines stress the importance of integrating both engineering and nature-based solutions ensuring infrastructure interventions are sustainable and climate resilient.

(d) & (e) The National Disaster Management Authority (NDMA) under the aegis of the Ministry of Home Affairs (MHA) has constituted the Committee on Disaster Risk Reduction (CoDRR) to provide a multi-disciplinary approach to Glacial Lake Outburst Floods (GLOF) Risk Reduction in collaboration with various Central/State government agencies and departments.

NDMA issued the GLOF management Standard Operating Protocol (SOP) in the form of Guidelines in 2020 and Compendium of Task Force Report for GLOF preparedness and response. The SoP delineates the roles and responsibilities, including actions to be taken by various stakeholders, for disaster risk management. These include regular satellite-based monitoring of glacial lakes, publication of monitoring reports, formation of a multi-agency Steering Committee for Glacier Monitoring and risk-mapping, and publishing monitoring bulletins periodically for identified high-risk. These actions are intended to detect and mitigate GLOF and related downstream flooding and sedimentation impacts.

Central Water Commission (CWC) in collaboration MoES and NDMA have instituted monitoring, early-warning and mitigation programs for 902 glacial lakes/water bodies (>10 ha) in the Himalayan region using remote sensing technology to identify glacier-related risks.

The National Remote Sensing Centre (NRSC) and CWC also maintain glacial lake inventories to identify lake mitigation interventions e.g. de-watering, controlled breaching, or structural mitigation etc.

Central Water Commission under Ministry of Jal Shakti, Government of India has also initiated Coastal Management Information system (CMIS) during 12th Plan period under the Development of Water Resources Information System (DWRIS) scheme. Under CMIS, a total of 8 coastal sites has already been established. The CMIS sites are chosen in consultation with the respective State/ UTs and the Coastal data collected under CMIS can be utilized by these stakeholders for planning/design of disaster-resilient infrastructure plan for coastal towns and other allied works.

Nine coastal parameters are being observed at CMIS sites. These data are being utilized by Maritime States/UTs and other stakeholders to make informed decisions on selecting suitable mitigation measures.

Further, the Coastal Protection and Development Advisory Committee (CPDAC) is a high-level inter-ministerial body, under the Central Water Commission (CWC), which provides a common platform for central agencies, coastal engineering experts, and representatives from Maritime States/UTs and relevant Central Departments to discuss and solve coastal erosion problems.

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