



RECENT FLOODS IN SOUTH INDIA

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Recent floods in South India

During the 2021 South West monsoon season (June-September), South Peninsular India received seasonal rainfall of 111% of its Long Period Average (LPA). The seasonal rainfall during the 2021 North East/Post Monsoon season (October-December) over the core region of the south peninsula (comprising of five sub-divisions viz. coastal Andhra Pradesh; Tamil Nadu; Puducherry and Karaikal; South Interior Karnataka; and Kerala and Mahe) was exceptionally above normal (171% of LPA) and was highest (579.1 mm) since 1901. All the five sub-divisions of the core region except coastal Andhra Pradesh and Yanam received large excess/excess rainfall during the season.¹

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1. https://mausam.imd.gov.in/Forecast/marquee_data/Annual%20Statement%20on%20Climate%20of%20India%202021..pdf

Since the beginning of the post-monsoon season in October 2021, low-pressure area over southwest Bay of Bengal, coupled with the northeast monsoon winds, consistently dumped above-average rainfall over South Peninsular India. Due to this depression, heavy downpour unleashed over Andhra Pradesh and neighbouring states, causing severe flooding.

The havoc caused by rains and floods put the normal life out of gear in the affected areas. The swelling of rivers and massive water inflows at the reservoirs caused flooding of drains and canals causing heavy water logging and inundation in low-lying areas. Extensive damages to standing crops and loss of human lives were reported. The flood waters damaged vital public infrastructure – roads, railway tracks, bridges, schools, health facilities, *etc.* and caused power supply disruption due to damage of electric poles and transformers. With large shifts in rainfall pattern, it is felt that such extreme events and changing weather conditions are repercussions of global climate change and their frequency will increase in the coming years.

Karnataka

South West Monsoon rainfall coupled with landslides and flooding situation affected various parts of Karnataka during July-September 2021. Unseasonal rains hit the State in the months of November-December 2021 too. Among the major affected parts of the State were Belagavi, Bagalkot, Bengaluru, Chikkamagaluru, Dharwad, Dakshina Kannada, Hassan, Haveri, Kodagu, Kolar, Shivamogga, Tumkur, Uttara Kannada, *etc.*

An Inter-Ministerial Central Team (IMCT) constituted by the Ministry of Home Affairs visited the State in September 2021 for on-the-spot assessment of damages caused by the floods/landslides of 2021. As per the report of IMCT, 20 human lives were lost, 10018 houses/huts damaged and 217897 hectares cropped area was lost/damaged in the wake of floods/landslides of 2021. The State Government of Karnataka had been allocated Rs. 843.20 crore (Rs. 632.80 crore as central share + Rs.210.40 crore as state share) under the SDRF for 2021-22.² Another IMCT visited the State in December 2021 also.

² <http://164.100.24.220/loksabhaquestions/annex/177/AU3039.pdf>

Andhra Pradesh

During November 2021, three districts of Rayalaseema – Kadapa, Chittoor and Anantapur, as well as the Nellore district, were the worst hit due to unprecedented rainfall and floods. The streets of Tirumala and the town of Tirupati were severely inundated. The heavy volume of inflows due to incessant rains caused breaches at Pincha project and Annamayya reservoir.³

As per the information received from the State Government, 46 human lives were lost, 7720 houses/huts were damaged and 5.29 lakh hectares of crop area was affected between July to November 2021. An IMCT visited the affected areas of Andhra Pradesh from 26th November to 29th November, 2021 for assessment of damages due to heavy rains/floods in the State. The State Government of Andhra Pradesh was allocated Rs. 1192.80 crore (Rs. 895.20 crore as central share + Rs. 297.60 crore as state share) under State Disaster Response Fund (SDRF) for 2021-22.⁴

Tamil Nadu

Continuous heavy showers caused by North East Monsoon lashed Chennai and other coastal districts of Tamil Nadu, causing high levels of flooding in both the northern and southern parts of the State. Among other places, Coimbatore, Chengalpattu, Cuddalore, Dharmapuri, Dindigul, Kancheepuram, Kanyakumari, Ranipet, Tirunelveli, Tiruvallur, Tuticorin, *etc.* were affected.

³ <https://www.indiatoday.in/india/story/andhra-rains-flood-death-toll-44-16-missing-ys-jagan-mohan-reddy-1881284-2021-11-26>

⁴ <https://pqars.nic.in/annex/255/AU1958.pdf>

The State Government reported loss of 54 human lives, damage to 11636 houses/huts and 51025.64 hectares crop area affected due to recent heavy rains and floods. An on-the-spot assessment of damages caused during the months of October-November, 2021 was done by the IMCT during its visit to the affected areas from 21st to 24th November, 2021. During the current financial year 2021-22, the State Government of Tamil Nadu was allocated Rs 1088.00 crore under SDRF, which includes Rs. 816.00 crore as central share and Rs. 272.00 crore as state share.⁵

Kerala

Flash floods hit Kerala in October 2021 triggered by extremely heavy rainfall events inducing multiple landslides in the coastal state. The widespread, excessive rain was caused by formation of a low pressure system over east-central and adjoining south-east Arabian Sea off Lakshadweep area and its movement to east-south-eastwards as a low pressure area towards the Kerala coast triggering severe weather. The heavy rainfall led to rapid rise in water levels of many of the west flowing rivers in the region causing swelling and flooding in them. Among other areas in central and southern Kerala, Idukki, Kottayam, Pathanamthitta, Thrissur and Thiruvananthapuram districts were badly affected. 42 persons died in October rain-related incidents this year in Kerala and close to 3,000 people were left houseless, according to the official data.

In 2021, Kerala witnessed the rainiest October month in the past 120 years. As per the IMD officials, the excess rainfall was due to the South West monsoon season prevailing until October 25, and the North East monsoon season commencing immediately after the South West monsoon's withdrawal.⁶

⁵ <https://pqars.nic.in/annex/255/AU1160.pdf>

⁶ <https://weather.com/en-IN/india/news/news/2021-11-08-after-rainiest-october-on-record-kerala-wet-november-continues>

Puducherry

Heavy rains lashed the Union Territory of Puducherry in November 2021 under the influence of a cyclonic circulation in the Bay of Bengal causing flooding in many parts – Bahur, Sivaranthagam, Upper Sathamangalam, Lower Sathamangalam, Karaikal, *etc.* An IMCT was deputed and visited the affected areas on 22nd and 23rd November 2021 to assess the damages caused due to heavy rains/floods. During the financial year 2021-22, an amount of Rs. 5 crore has been released to the UT of Puducherry under the Union Territory Disaster Response Fund (UTDRF).⁷

The frequent occurrence of floods can be attributed to various factors such as:

- High intensity rainfall in short duration
- Poor or inadequate drainage/channel carrying capacity
- High silt load in rivers/erosion of river banks
- Encroachment of river beds and riverine areas
- Deforestation/Watershed degradation
- Loss/destruction of wetlands
- Unplanned reservoir regulation
- Failure of flood control structures
- Snowmelt, glacial lake out-bursts, cloud bursts

Flood Categories

The Central Water Commission has categorized various flood situations in the country into three different categories, namely *Above Normal*, *Severe* and *Extreme* depending upon the river water level with reference to *Warning level*, *Danger level*, and *Highest Flood level*.

❖ **Above Normal Flood:** If the water level of the river at flood forecasting site

⁷ <http://164.100.24.220/loksabhaquestions/annex/177/AU3863.pdf>

touches or crosses its Warning level, but remains below the Danger Level of the site then the flood situation is called the “Above Normal” situation.

- ❖ **Severe Flood:** If the water level of the river at the forecasting site touches or crosses Danger Level but below the Highest Flood Level of the forecasting site then the flood situation is called “Severe Flood” situation.
- ❖ **Extreme Flood:** The flood situation is said to be “Extreme” when the water level of the river touches or crosses the “Highest Flood Level” recorded at any forecasting site so far.⁸

Flood Prone States

The Ganga-Yamuna basin states of Uttar Pradesh, Bihar and West Bengal are prone to floods. Besides, floods in Brahmaputra river affect Assam too. The delta parts of river basins states of Odisha, Andhra Pradesh, Gujarat are identified as prone to floods. However, of late, the upper reaches of river basins of Krishna, Godavari caused severe floods in the states of Karnataka and Maharashtra. Even states like Kerala received significant rainfall causing widespread floods in the state.⁹

As per the India Meteorological Department's (IMD) Annual Statement on the Climate of India during 2021, the annual rainfall over the country as a whole during 2021 was 105% of its Long Period Average (LPA) based on the 1961-2010 period.¹⁰

⁸ http://164.100.47.193/lsscommittee/Water%20Resources/17_Water_Resources_12.pdf

⁹ <https://www.niti.gov.in/sites/default/files/2021-03/Flood-Report.pdf>

¹⁰ https://mausam.imd.gov.in/Forecast/marquee_data/Annual%20Statement%20on%20Climate%20of%20India%202021..pdf

Flood Management in the Country

Flood management including erosion control falls within the purview of the States. The State Governments concerned formulate and implement the flood management and anti-erosion schemes as per their priority.¹¹ The Union Government supplements the efforts of the States by rendering technical guidance and providing financial assistance for management of floods in critical areas.

i. Relief Measures: In the wake of natural disasters, the State Governments undertake distribution of relief measures to the affected people from the State Disaster Response Fund (SDRF), already placed at their disposal in accordance with the Government of India's approved items and norms of expenditure. In the event of disaster of a 'severe nature', additional financial assistance is provided from the National Disaster Response Fund (NDRF), as per the laid down procedure which includes an on-the-spot assessment of damages based on the visit of an Inter-Ministerial Central Team (IMCT) and its report.¹² The financial assistance from SDRF/NDRF is provided by way of relief and not for compensation of loss suffered/claimed.

ii. Early Warning System: A robust early warning system has been established by the Central Government to significantly enhance the accuracy of weather forecasts. With a view to educate the people/farmers at the time of natural calamities, mock exercises and community awareness programmes are regularly conducted. Multi-purpose cyclone shelters and early warning systems created in the Coastal States under the National Cyclone Risk Mitigation Project (NCRMP) have proved to be of immense help during the recent cyclones.¹³ National Disaster Response Force (NDRF) teams are deployed in the flood prone areas in the country and rescue/evacuate stranded persons including farmers to safer places.

Role of the Central Water Commission and India Meteorological Department

Central Water Commission (CWC) is the nodal Organisation entrusted with the task of flood forecasting and early flood warnings in the country. CWC also issues inflow forecasts to identified reservoirs for proper reservoir regulations during floods. Flood forecast formulation

¹¹ <https://www.niti.gov.in/sites/default/files/2021-03/Flood-Report.pdf>

¹² <https://pqars.nic.in/annex/255/AU1958.pdf>

¹³ <https://pqars.nic.in/annex/255/AU2783.pdf>

methodology used by CWC includes gauge to gauge correlation technique for short range (up to 24 hours) forecasting and numerical modelling technique for 5 days advisory forecasts at identified stations, providing thereby more lead time to the local authorities to plan evacuation of people and take remedial measures. The number of forecast stations has increased from 175 in the year 2014 to 331 stations (132 dam/barrage inflow forecast stations + 199 river level forecast stations) in the year 2021. These stations cover 20 major river basins in 23 States and 2 Union Territories.^{14,15} CWC also compiles the yearly flood damage data on the basis of information received from the States. Flood damage data at the district level is not maintained centrally.

As per the CWC flood forecasting network, during the last 3 years, extreme floods (water level above previous Highest Flood Level) were also witnessed in the states of Kerala, Karnataka, Tamil Nadu, Andhra Pradesh, Telangana, *etc.* in addition to the existing flood prone states, due to excess to large excess rainfall in these states combined with extremely heavy rainfall in short duration.

India Meteorological Department (IMD) supports the flood warning services of CWC by providing observed and forecasted rainfall. CWC works in close association with IMD and State Governments for timely flood forecast whenever the river water levels rise above warning level. In order to meet the specific requirements of flood forecasting by CWC, IMD operates Flood Meteorological Offices (FMOs) at fourteen locations in the country, including at Bengaluru, Chennai, Hyderabad and Thiruvananthapuram. In order to cater to the services of hydro-meteorological events occurring in short duration of time, IMD is issuing Flash Flood Guidance (FFG) by which a diagnostic value within a watershed required to produce flooding at the outlet of the catchment is estimated, to support the flood warning services.

Storm Water Drainage is one of the focus areas under the 'Atal Mission for Rejuvenation and Urban Transformation' (AMRUT) in select 500 cities and towns of the country. Further, the Ministry of Housing and Urban Affairs has published a Manual on Storm Water Drainage Systems, 2019 to provide guidance towards all aspects of sustainable design, planning and

¹⁴ <http://164.100.24.220/loksabhaquestions/annex/177/AS66.pdf>

¹⁵ <http://164.100.24.220/loksabhaquestions/annex/177/AU842.pdf>

management of storm water drainage systems and emergency plan for flood response in urban areas.¹⁶

Flood Management Provisions in The Dam Safety Act, 2021

The amendments made by Rajya Sabha on 2nd December 2021 were agreed to by Lok Sabha on 8th December 2021 and ‘The Dam Safety Bill, 2021’ has been assented by the President on 13th December 2021. The Act seeks to provide for surveillance, inspection, operation and maintenance of dams for prevention of dam failure related disasters and to provide for institutional mechanisms to ensure their safe functioning.¹⁷

As per the provisions of the Act, every owner of a specified dam shall:

- undertake every year, through their dam safety unit, a pre-monsoon and post-monsoon inspections in respect of each such dam. (Clause 31(1))
- inspect or cause to be inspected every specified dam by the dam safety unit, during and after every flood, earthquake or any other natural or man-made calamities, or if any sign of distress or unusual behaviour is noticed in the dam. (Clause 31(2))
- station, at each of the specified dam site throughout the monsoon period, such engineers and other technical personnel, as may be decided, in consultation with the State Dam Safety Organisation. (Clause 31(3)(b))
- in respect of each specified dam, - (a) establish well designed hydro-meteorological network and an inflow forecasting system; (b) establish an emergency flood warning system for the probable flood affected areas downstream of the dam;(e) make available the information relating to maximum anticipated inflows and outflows including flood warning and an adverse impact of the same, if any, on persons and property towards the upstream or downstream of the dam, to the concerned district authorities and also make available the information in public domain; and (f) render necessary assistance to the National Dam Safety Authority in establishment and running of the early warning system for the exchange of real time hydrological and meteorological data and information related to the operation of reservoirs. (Clause 35(1))

¹⁶ <http://164.100.24.220/loksabhaquestions/annex/177/AU1983.pdf>

¹⁷ <http://jalshakti-dowr.gov.in/sites/default/files/Dam%20Safety%20Act%202021.pdf>

- in respect of each of specified dam, prepare emergency action plan that shall include therein identification of the likely catastrophic flood in the event of any dam failure, along with probable areas, population, structures and installations likely to be adversely affected due to flood water released from the reservoir. (Clauses 36(1) and (2))

Parliamentary Standing Committee on Water Resources

The 12th Report of the Parliamentary Standing Committee on Water Resources¹⁸ on “Flood Management in the country including International Water Treaties in the field of Water Resource Management with particular reference to Treaty/Agreement entered into with China, Pakistan and Bhutan” was presented to Lok Sabha on 5th August 2021. The following are some of the key recommendations of the Committee:

- The Union Government must take up responsibility for coordinating the national efforts for flood control and mitigation with all stakeholders.
- A permanent institutional structure in the form of National Integrated Flood Management Group (NIFMG) may be set up under the chairmanship of Hon’ble Minister of Jal Shakti. Concerned Ministers of the State Governments should be the members of this group.
- NIFMG should exercise supervision over all aspects of flood management in the country including those issues, which fall in the domain of State/local governments as well as which are of international linkages.
- A River Basin Authority may be set up for each river basin of the country to ensure integrated operation of reservoirs.
- Concerted efforts be made to convince the States and arrive at a national consensus so that the Project for Inter Linking of Rivers (ILR) becomes a reality.

Way Forward

The measures, taken by the Central and State Governments, have significantly improved the disaster management practices, preparedness, prevention, mitigation and response mechanisms resulting in significant reduction in casualties during natural calamities, including floods and cyclones, in the country.

¹⁸ http://164.100.47.193/lsscommittee/Water%20Resources/17_Water_Resources_12.pdf

- Forecasting agencies need to continue their efforts for further enhancement of accurate weather forecasting services along with warning and dissemination systems in the country. This will facilitate timely alerts for people living on the banks of rivers and tributaries, as also the fishermen in coastal areas.
- Morphological studies by reputed research institutes need to be carried out for major rivers for location of vulnerable spots for bank erosion/deposition, aggradation/degradation, *etc.*
- Construction of sufficient number of rain water harvesting and artificial recharge structures to harness monsoon rainfall.
- Controlling the illegal encroachment and diversion of water bodies and drainage channels.
- Since complete immunity from floods is not possible, the aim needs to be at minimizing the risks associated with floods, with involvement of all stakeholders. The concept of integrated flood management involving a judicious mix of structural and non-structural measures needs to be used in controlling the flood damages.
- Balance needs to be made between the growing development needs and conservation of fragile ecology, particularly of the Western Ghats.

Sources

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5. *Answers to Parliament Questions.*