



Strengthening India's Disaster Safety Net

This editorial is based on “[Two decades after the Indian Ocean tsunami: reflecting on a global turning point in disaster management](#)” which was published in Times of India on 25/12/2024. The article brings into picture India’s transformation in disaster management since the 2004 Indian Ocean Tsunami, highlighting its evolution into a regional leader through initiatives like the Disaster Management Act of 2005.

For Prelims: [2004 Indian Ocean Tsunami](#), [Disaster Management Act of 2005](#), [National Disaster Response Force](#), [Bhopal Gas Tragedy](#), [Bhuj Earthquake](#), [Sendai Framework for Disaster Risk Reduction](#), [Coalition for Disaster Resilient Infrastructure](#), [Smart Cities Mission](#), [Cyclone Mocha](#), [Kedarnath flood](#), [Mahatma Gandhi National Rural Employment Guarantee Act](#)

For Mains: Major Disaster Challenges Confronting India, Evolution of Disaster Management Framework in India.

Nearly **2 decades after the devastating 2004 Indian Ocean Tsunami**, which claimed over 230,000 lives, India has transformed its **disaster management approach**. Through the [Disaster Management Act of 2005](#), it established the National Disaster Management Authority and the [National Disaster Response Force](#), evolving from a victim to a regional leader. Yet, with its vast coastline, diverse geography, and growing climate vulnerabilities, persistent challenges remain, demanding **continuous vigilance and advancements in disaster response mechanisms**.

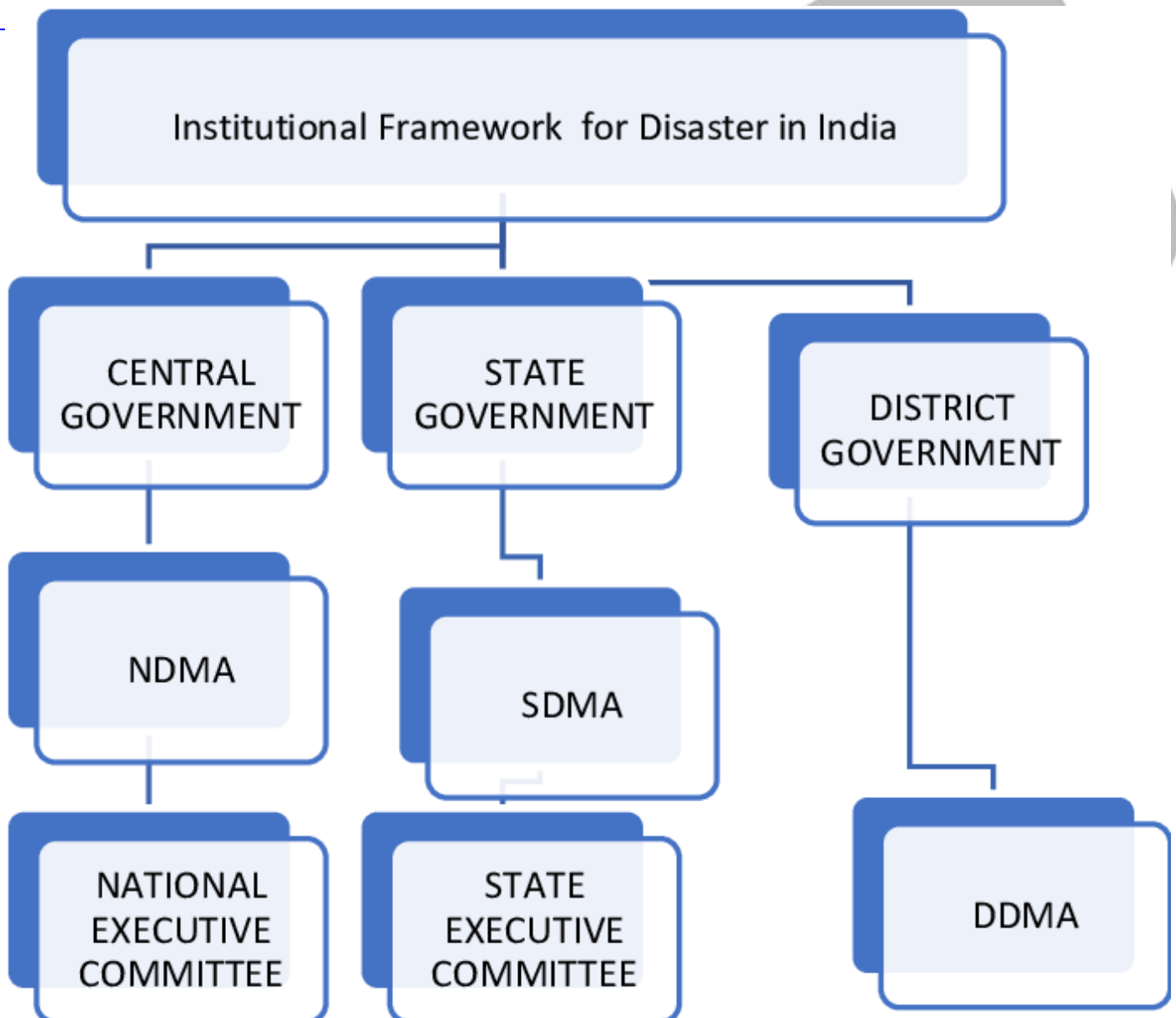
How has the Approach to Disaster Management Evolved in India?

- **Early Years: Relief-Centric and Reactive Approach (Pre-1980s)**
 - **Focus on Relief and Rehabilitation:** In the initial years post-independence, disaster management was limited to reactive relief efforts, such as **food distribution, temporary shelters, and medical aid**.
 - The responsibility primarily lay with state governments, supported by central assistance during major calamities.
 - Events like the **Bihar famine (1966-67)** and **Drought of 1972** revealed inefficiencies in relief distribution and lack of preventive measures.
- **Shift Toward Planning and Preparedness (1980s-2000s)**
 - **Increased Institutional Focus:** The establishment of the **Department of Environment (1980)**, later the Ministry of Environment and Forests, addressed disaster-linked environmental concerns.
 - **Response to Major Events:** The [Bhopal Gas Tragedy \(1984\)](#), one of the worst industrial disasters, highlighted the need for stricter safety regulations and disaster management in industries.
 - **Cyclones in Andhra Pradesh (1990)** and **Latur Earthquake (1993)** led to

improvements in relief coordination, but prevention and mitigation remained limited.

- **Formation of National Organizations:** In 1990, the **Cyclone Warning Directorate was established in New Delhi** to coordinate cyclone warning activities across the country and serve as the **Regional Specialized Meteorological Centre-Tropical Cyclones (RSMC-TC)** for providing regional guidance.
- **Institutionalization of Disaster Management (2000s)**
 - **Key Disasters as Turning Points:** The **Bhuj Earthquake (2001)** exposed vulnerabilities in urban planning and infrastructure safety, prompting systemic reforms in preparedness.
 - The **Indian Ocean Tsunami (2004)** caused massive devastation, leading to a paradigm shift in India's disaster management strategies.
 - **Enactment of the Disaster Management Act (2005):** The Act institutionalized disaster management in India, creating a dedicated framework.
 - The **National Disaster Management Authority (NDMA)** was established, with **state (SDMAs) and district (DDMAs) counterparts**.
 - The focus shifted to the four pillars of disaster management: mitigation, preparedness, response, and recovery.

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- **Proactive and Resilience-Focused Approach (2010-Present)**
 - **Shift to Mitigation and Resilience:** Emphasis on risk reduction under global frameworks

like the **Hyogo Framework for Action (2005-2015)** and [Sendai Framework for Disaster Risk Reduction \(2015-2030\)](#).

- **Adoption of Technology:** Advanced systems like [Doppler Radar](#), **flood forecasting** and real-time data sharing platforms.
 - **Community-Centric and Inclusive Strategies:** Programs like [Aapda Mitra](#) and school disaster management plans empower local communities to act as first responders.
 - **Global Collaborations:** India contributes to and benefits from global frameworks such as [SAARC Disaster Management Centre](#) and the [United Nations Office for Disaster Risk Reduction](#).
 - Participation in [Coalition for Disaster Resilient Infrastructure \(CDRI\)](#) to develop resilient infrastructure
- **Evolving Focus Area:**
- **Addressing Climate-Induced Disasters:** India incorporated climate resilience into disaster management plans due to increasing climate-related risks.
 - Focus on **nature-based solutions like mangrove restoration** under programs like [Namami Gange](#) to mitigate flooding.
 - **Urban Disaster Management:** Integration of urban resilience into development frameworks under the [Smart Cities Mission](#) to address risks like urban flooding.
 - **Bengaluru's flood management plans post-2022** floods emphasize wetland restoration and stormwater infrastructure upgrades.

What are the Major Disaster Challenges Confronting India?

- **Escalating Climate-Induced Disasters:** India is experiencing an increasing frequency of **extreme weather events** due to climate change, exposing gaps in mitigation frameworks.
 - [Cyclone Mocha \(2023\)](#) impacted **Sundarbans**, while record-breaking rainfall in Himachal Pradesh (2023) caused over **₹10,000 crore in losses**, exacerbated by deforestation and unregulated development.
 - A recent study revealed that **India faced extreme weather events on 314 out of 365 days in 2023**.
 - The **lack of climate-resilient infrastructure** amplifies both human and economic vulnerabilities.
- **Urban Flooding as a Result of Chaotic Urbanization:** Rapid urban expansion without sustainable planning has turned cities into flood hotspots.
 - Rapid urbanisation intensifies the challenge of urban flooding, leading to peak water levels **rising 1.8 to 8 times in developed cities**.
 - **Chennai's 2021 floods**, caused by outdated drainage systems and illegal construction on wetlands, disrupted life and led to economic losses.
 - The **2022 Bengaluru floods were largely due to rampant corruption in the civic body**, resulting in extensive encroachments on lakes, lake beds, storm-water drains (**rajakaluves**), and buffer zones.
- **Himalayan Fragility and Glacial Retreat:** Melting glaciers and unstable Himalayan geology are leading to high-magnitude disasters like landslides and glacial lake outbursts.
 - The [Kedarnath flood \(2013\)](#) and the **Chamoli disaster (2021)** highlighted cascading risks due to unchecked hydropower projects and deforestation.
 - From 1975 to 2000, Himalayan glaciers lost an average of 4 billion tonnes of ice annually, which **doubled to 8 billion tonnes per year between 2000 and 2016**.
 - This endangers not just livelihoods but also water security for millions downstream.
- **Industrial Hazards and Rising Chemical Disasters:** India's lax enforcement of industrial safety norms has resulted in repeated industrial accidents.
 - The [Vizag gas leak \(2020\)](#) exposed over 10,000 people to toxic fumes, while the **Ludhiana gas tragedy (2023)** highlighted the lack of real-time monitoring of hazardous materials.
 - Government data reveals that an average of **3 workers lose their lives daily in Indian factories** due to inadequate safety measures yet implementation of **NDMA's chemical disaster guidelines** remains fragmented, especially in **Tier-2 and Tier-3 cities**.
- **Agricultural Vulnerabilities and Drought Risks:** Erratic monsoons, heatwaves, and groundwater depletion have worsened drought conditions, crippling **India's agrarian economy**.
 - The **2022 Latur drought** saw crop failures. More than **60% of the people in Latur** are

engaged in agriculture, making drought a serious issue

- **40% of Indians will have no access to drinking water by 2030** (NITI Aayog). Despite schemes like **PMKSY (Pradhan Mantri Krishi Sinchayee Yojana)**, irrigation infrastructure and rainwater harvesting remain inadequate.
- **Forest Fires and Loss of Carbon Sinks:** Forest fires in India are increasing both in frequency and intensity due to climate change and human-induced factors.
 - The **India State of Forest Report (ISFR) 2023**, revealed that Uttarakhand alone recorded **5,351 forest fires** between **November 2022 to June 2023**.
 - The **Simlipal fires in Odisha (2021)** lasted for over 10 days, affecting close to one-third area.
- **Health Crises Following Disasters:** Disasters exacerbate **public health emergencies**, with disrupted sanitation, contaminated water supplies, and weakened healthcare systems.
 - For instance, after the **2018 Kerala floods**, waterborne diseases increased, with **leptospirosis** and **cholera** being the most common.
 - Limited deployment of mobile health units and slow response times highlight glaring gaps in disaster healthcare infrastructure.
- **Weak Early Warning Systems and Coordination Failures:** Although technological advancements have improved forecasting, gaps in last-mile connectivity remain critical.
 - A **2023 World Meteorological Organization (WMO) report** highlighted that **India ranked 14th out of 21 countries** in early warning system effectiveness, with below-average scores in risk knowledge, observation, forecasting, warning, dissemination, and preparedness.
- **Gendered and Social Inequities in Disasters:** Disasters amplify existing social vulnerabilities, with women, children, and marginalized groups disproportionately affected.
 - For example, following cyclones like Amphan and Yaas, **women and children in affected areas were targeted by traffickers**, and social inequalities worsened as communities struggled with recovery.
- **Gaps in Institutional Frameworks and Funding:** India's disaster management frameworks remain **reactive rather than proactive**, with insufficient funding for mitigation efforts.
 - A total of ₹68,463 crore has been allocated for the NDRMF from 2021-22 to 2025-26, with 80% for the National Disaster Response Fund **leaving just 20% for the National Disaster Mitigation Fund**.
 - Weak institutional accountability and fragmented policies hinder effective disaster risk reduction and resilience-building.

What Lessons India Can Learn from Other Countries in Disaster Management?

- **Japan's Earthquake Preparedness:** Japan's **strict building codes, retrofitting of infrastructure, and regular earthquake drills** ensure minimal casualties during seismic events.
 - India can adopt similar seismic safety norms in high-risk zones like the Himalayas.
- **Bangladesh's Cyclone Management:** Bangladesh's efficient evacuation strategies drastically reduced cyclone-related fatalities. India can improve community-based disaster planning in coastal regions.
- **Netherlands's Flood Management:** The Netherlands has a network of **dikes, dams, and floodgates** to protect against storm surges from the sea.
 - India's urban flood management can benefit from replicating these solutions in cities like Mumbai and Chennai.
- **South Korea's Technological Integration:** South Korea uses integrated digital platforms for disaster response coordination across agencies. India can adopt centralized command systems for better inter-agency coordination.
- **Sweden's Climate Adaptation:** Sweden's proactive climate adaptation policies include integrating disaster risk reduction with urban planning.
- India can align its **Smart Cities Mission** with climate resilience strategies.

What Measures can India Adopt to Enhance Disaster Resilience and Mitigation?

- **Strengthening Climate-Resilient Infrastructure:** India needs to invest in climate-resilient infrastructure that can withstand extreme weather events such as **cyclones, floods, and heatwaves**.
 - Developing **green buildings, flood-resistant urban drainage systems**, and cyclone-proof housing in coastal areas is essential.
 - For example, **Odisha's cyclone shelters** have saved countless lives, a model that can be replicated nationwide.
 - Integrating the **Smart Cities Mission with climate-resilience planning** can ensure urban growth aligns with disaster mitigation goals.
- **Implementing Community-Based Disaster Risk Reduction (CBDRR):** Local communities must be empowered to manage risks through **training, capacity building, and disaster preparedness exercises**.
 - Combining **Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA)** with **community-led hazard mapping** can create sustainable assets like embankments and check dams.
- **Integrated Water Resource Management (IWRM) to Combat Urban and Rural Flooding:** A unified approach to water management can address flooding and drought challenges simultaneously.
 - This includes restoring **wetlands**, building **urban rainwater harvesting systems**, and strengthening embankments along rivers.
 - Integrating **Namami Gange with city-level flood prevention plans** can address urban flooding while enhancing river health.
- **Modernizing Early Warning Systems with Technology:** India must adopt advanced technologies like **AI, IoT, and geospatial mapping** to modernize early warning systems.
 - Expanding the scope of the **Common Alerting Protocol (CAP)** to integrate **mobile alerts with local language support** can enhance last-mile communication.
 - Leveraging **ISRO's satellite capabilities** to monitor high-risk zones, combined with **AI-powered models**, can reduce response times.
- **Retrofitting Seismic Zones and Enforcing Building Codes:** India needs to enforce stringent compliance with **seismic safety codes**, especially in urban areas and high-risk zones like the **Himalayas**.
 - **Retrofitting old structures**, particularly schools and hospitals, can minimize casualties during earthquakes.
 - Linking such efforts with **Pradhan Mantri Awas Yojana (PMAY)** can ensure affordable housing adheres to disaster-resilient norms.
- **Scaling Up Insurance Coverage for Disaster Losses:** Developing microinsurance schemes tailored to **farmers, small businesses, and vulnerable populations** can mitigate financial losses post-disasters.
 - Linking crop insurance under the **Pradhan Mantri Fasal Bima Yojana (PMFBY)** with parametric insurance models for faster payouts can provide timely relief.
 - Integrating **disaster insurance into the financial inclusion agenda under Jan Dhan accounts** can ensure wide coverage, especially in rural areas prone to recurrent disasters.
- **Strengthening Urban Disaster Preparedness via Smart Cities Mission:** Urban centers must prioritize integrating disaster management into their development plans.
 - **Cities under the Smart Cities Mission** can be mandated to adopt risk-sensitive zoning and automated weather monitoring systems.
 - For example, **Surat's early flood-warning system reduced** damages during monsoons.
 - Collaborating with startups under the Startup India scheme can foster innovation in **urban disaster resilience technologies**.
- **Integrating Climate Change Mitigation with Disaster Risk Management:** India must align its climate change mitigation strategies with disaster resilience efforts by adopting nature-based solutions.
 - A recent study found mangroves **reduce flood damage by \$65 billion globally each year**. Implementing **mangrove restoration programs** in coastal areas, as in Sundarbans, can reduce cyclone impacts while sequestering carbon.
- **Institutional Capacity Building and Unified Response Systems:** Streamlining coordination among institutions like **NDMA, SDRFs, and local governments** can ensure a faster response during disasters.

- Establishing **unified command centers** equipped with real-time data analytics can enhance coordination.
- Linking National Disaster Response Force (NDRF) operations with tech platforms like **GIS-based planning tools** can further improve efficiency.
- **Gender-Inclusive Disaster Policies for Equitable Recovery:** Disaster policies must incorporate **gender-sensitive approaches** to address the unique vulnerabilities faced by women and marginalized groups.
 - Integrating **women-led self-help groups (SHGs) under the Deendayal Antyodaya Yojana** into **disaster relief and recovery efforts** can ensure inclusive outcomes.
- **Creating a Transboundary Disaster Management Framework:** India should collaborate with neighboring countries to **develop transboundary mechanisms for shared disaster risks**.
 - Regional cooperation with **China and Bangladesh** can enhance cyclone preparedness in the Bay of Bengal.
 - Integrating transboundary mechanisms into the **SAARC Disaster Management Center's initiatives** can create a regional safety net.
- **Institutionalizing Disaster Education and Awareness:** Incorporating disaster preparedness education into school curriculums can build a culture of safety from a young age.
 - Programs like the **Aapda Mitra scheme** for disaster volunteers can be expanded to **rural schools to train students in basic response techniques**.
 - Linking **disaster education through Social Media influencers** can amplify outreach.

Conclusion:

The implementation of the **Disaster Management Act of 2005**, along with the incorporation of the **Sendai Framework for Disaster Risk Reduction**, has significantly strengthened national preparedness. However, challenges such as climate-induced disasters, urban flooding, and industrial hazards persist. India's approach to disaster management needs to be evolved from a **reactive, relief-focused model to a proactive, resilience-driven framework**.

Drishti Mains Question:

Critically evaluate India's disaster management framework, highlighting key policy reforms, persisting challenges, and potential measures to strengthen disaster resilience in the context of increasing climate vulnerabilities.

UPSC Civil Services Examination Previous Year Question (PYQ)

Mains:

Q. Discuss the recent measures initiated in disaster management by the Government of India departing from the earlier reactive approach. (2020)

Q. Vulnerability is an essential element for defining disaster impacts and its threat to people. How and in what ways can vulnerability to disasters be characterized? Discuss different types of vulnerability with reference to disasters. (2019)

Q. Describe various measures taken in India for Disaster Risk Reduction (DRR) before and after signing 'Sendai Framework for DRR (2015-30)'. How is this framework different from 'Hyogo Framework for Action, 2005'? (2018)