



Global Best Practises in Flood Risk Management

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Why in News?

[Climate change](#) is increasing severe [floods](#), making resilience vital. Global best practices such as **Tanzania's Msimbazi Basin Project** shows how nature-based solutions and modern infrastructure can reduce risks and strengthen climate resilience, **offering lessons for India's flood management strategies**.

What are the Leading Global Best Practices in Flood Risk Management?

- **Tanzania's Msimbazi Basin Development Project:** A World Bank-funded project in **Dar es Salaam** aims to reduce flooding by dredging the river, improving drainage, and upgrading infrastructure.
 - It also relocates vulnerable residents and converts floodplains into green, climate-resilient areas.
- **Netherlands's Floating Homes:** Built with **concrete and glass**, these flood-resistant homes float during floods, preventing water intrusion. Solar panels and heat exchangers provide continuous power.
- **Vienna's Flood Protection System:** In 1969, **Vienna built a 21-km flood relief channel parallel to the Danube River**.
 - This channel absorbs excess floodwater, relieving pressure on the main river, and activates only when needed to protect the city.
- **China's Sponge Cities:** The "**Sponge Cities**" utilize nature-based solutions like **permeable surfaces and wetlands to absorb** and store rainwater, mimicking Earth's natural water absorption, unlike traditional cities that rapidly drain water via hard surfaces.
- **Denmark's Green Climate Screen:** A rainwater system channels water from gutters to mineral wool behind willow panels, **absorbing moisture naturally**.
 - Excess water flows to **planters or green spaces**, reducing flood risks without costly infrastructure or energy use.
- **Texas-Harnessing AI and Satellite Imagery:** The **University of Arizona and Google's Flood Hub** use **AI and satellite data to create detailed flood maps** and provide 7-day forecasts, improving flood justice and global preparedness.

How Vulnerable is India to Flood Risks?

- **Extent of Flood-Prone Area:** Out of India's total 329 million hectares, over **40 million hectares are vulnerable to floods**.
 - India leads globally with over 158 million slum dwellers in flood-prone areas.
 - Also, India experienced **5.4 million internal displacements in 2024 due to floods, storms**, and other disasters- the highest number in 12 years.
- **Economic Impact:** Analysis of the past two decades shows **floods cause around 63% of India's annual economic losses**.
 - Monsoon patterns have become highly unpredictable, with sudden heavy rainfall causing

floods and prolonged dry spells leading to drought.

What are the Key Strategies Adopted for Flood Risk Management in India?

- In India, **flood control** is primarily a **State subject**, thus, the responsibility for flood control lies largely with the **State Governments**, while the **Central Government's role** is more **technical, advisory, and supportive**.
- **Engineering/Structural Measures:**
 - **Interlinking of Rivers:** Under the [National Perspective Plan \(NPP\)](#), interlinking of rivers can help prevent floods by diverting excess water from flood-prone basins, such as the **Ganga-Brahmaputra-Meghna**, to water-scarce regions.
 - This **redistributes water flow, reduces peak discharge in rivers during heavy rains**, and minimizes the risk of overflowing banks and inundation in vulnerable areas.
 - **Reservoirs:** Help **moderate flood intensity by storing water during high discharge periods and releasing it after the peak flow**. Their effectiveness depends on capacity and proximity to flood-prone areas.
 - **Detention Basins:** These are natural depressions improved by constructing embankments and regulating water release. Examples include basins in **Rajasthan** and **Bihar**.
 - **Embankments:** Prevent floodwaters from spilling over. These are widely used but may have long-term issues like riverbed elevation and erosion. Maintenance is crucial, especially in places like **Assam** and **Bihar**.
 - **Channelization:** It involves controlling river courses and improving hydraulic conditions to prevent flooding. **Dredging** and **desilting** help rivers carry floodwaters efficiently.
 - **Diversion of Flood Waters:** **Diversion channels** and spillways help direct floodwaters away from vulnerable areas.
 - Examples include the **Krishna-Godavari Drainage Scheme** and **Thottapally Spillway** in Kerala.
- **Administrative/Non-Structural Measures:**
 - **Flood Forecasting and Warning:** The [Central Water Commission](#) provides real-time flood forecasts, which help authorities evacuate people and property to safer areas.
 - **Flood Plain Zoning:** Involves designating areas prone to flooding and regulating development in these regions to minimize flood damage.
 - **Flood Proofing:** This involves raising settlements above the flood levels, particularly in areas like **Uttar Pradesh, West Bengal, and Assam**.

Keywords for Mains

- **“River as Resource, Not Risk”** : Restoring riverine ecosystems for flood control.
- **“Forecast to Forewarn”**: Leveraging AI, satellite imagery, and hydrological modeling for early warning systems.
- **“Resilience is the New Development”** – Growth that survives climate shocks.
- **“Communities at the Core”** – Inclusive planning with local populations for resilience and early response.

Conclusion

Building flood resilience in India demands the **3Fs- Forecasting, Financing, and Frontline Preparedness** to shift from reactive relief to proactive risk reduction.

Drishti Mains Question:

Assess India's reliance on structural flood control measures and highlight the importance of integrating nature-based solutions, drawing insights from global best practices.

UPSC Civil Services Examination, Previous Years Questions (PYQs)

Mains:

Q. The interlinking of rivers can provide viable solutions to the multi-dimensional inter-related problems of droughts, floods, and interrupted navigation. Critically examine. **(2020)**

Q. Account for the huge flooding of million cities in India including the smart ones like Hyderabad and Pune. Suggest lasting remedial measures. **(2020)**

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