

#### 4. Analyse the development of scientific development and Initiative in flood management in Bihar? How far technology is key to flood cascading?

**Introduction:** Mention some to data related to flood in Bihar

**Body**

- Flood management in Bihar
- Initiatives for flood management
- Technology in flood management

**Conclusion:** Mention other measures to curb flood

**Introduction:**

Bihar is India's most flood-prone state, with 76% population in the North Bihar living under the recurring threat of flood devastation. Bihar makes up 16.5% of India's flood affected area and 22.1% of India's flood affected population. About 73.06% of Bihar's geographical area, i.e. 68,800 square kilometres (26,600 sq mi) out of 94,160 square kilometres (36,360 sq mi), is flood affected.

**Body**

**Flood in Bihar**

Bihar's topography is marked by a number of perennial and non-perennial rivers of which, those originating from Nepal are known to carry high sediment loads that are then deposited on the plains of Bihar. A majority of the rainfall in this region is concentrated in the 3 months of monsoon during which the flow of rivers increases up to 50 times causing floods in Bihar. According to the Bihar Government's Flood Management Information Systems Cell, floods of Bihar can be divided into 4 categories namely:

1. Class I: Flash floods– floods occurring due to rainfall in Nepal, lead time is short (8 hours), receding of flood waters is fast;
2. Class II: River floods– lead time 24 hours, receding of flood waters is 1 week or more;
3. Class III: Drainage congestion in river confluence- lead time more than 24 hours, lasting full monsoon season (i.e. receding of flood water takes 3 months).
4. Class IV: Permanent water logged area.

**Initiatives for flood management in Bihar**

- Bihar has been undertaking primarily **structural measures** to deal with floods such as building of embankments, channel improvement and embankment protection works. Around 5287 kms of embankments have been constructed until 2017. A total cost of around INR 12.5 billion was spent in flood protection in 2018.
- Early warning system, Real Data Time Acquisition System, Spatial Database System, use of remote sensing & GIS and other arrangements have been taken up by Bihar government's Water Resource Department (WRD)
- **Early warning system:** The centre has developed a flood forecast model with a 72-hour lead time for rivers like Gandak, Bagmati-Adhwara, Kamala, Kosi, and Mahananda, which originate in Nepal. The centre also assesses the Ganga starting between Buxar and Kahalgaon. With mathematical modelling, AI, a personal locator beacon, and machine learning (ML), the centre assesses precipitation, humidity, temperature, and the last seven days' hydrological data and three days' forecasted hydrological data to provide a weather forecast.
- **India Meteorological Department (IMD)** announced its plan to use AI in weather forecasting especially for issuing nowcasts, which can help improve 3-6 hours prediction of extreme weather events.
- IMD uses different tools like **radars and satellite imagery**, to issue nowcasts, which provide information on extreme weather events occurring in the next 3-6 hours.
- The IMD wants to better the nowcast predictions through **Artificial Intelligence and Machine Learning**, which will help understanding past weather models and speed up decision-making.
- **Geographic information systems (GIS)** helped in early assessing of flood

**Technology in flood management**

- The '**Room for the River project**' of the Dutch created more space for the river so that it can manage very high water levels during floods.



- Neera Shreshta Pradhan from International Centre for Integrated Mountain Development (ICIMOD), Nepal, suggested involving community in flood management and sending them regular warning related to increase or decrease in water level.
- **Use of drones:** Drones will be connected with control rooms. Fast internet connections will be used to send pictures and other information
- **LIDAR:** Photo above of a light-detection and ranging map (LIDAR) gives the elevation of a given area using laser technology. LIDAR uses the reflection to construct a 3D view of a location, making it easy to see changes in the area.
- A **remote-controlled unmanned aerial vehicle** is helpful to find drainage obstacles such as dense water hyacinth.
- **Satellite images from the Geo-Informatics and Space Technology Development Agency** can help the government with flood relief and in determining which critical risk areas need immediate drainage.
- **Computer-controlled water gate system** with manual platforms to manage gates are more effective, particularly those in highly flooded areas that were difficult to access.
- **Strengthening of the Community based Information System using PPP model** as in Bangladesh and seeking the expertise of the UK Environment Agency in flood management using the latest technology measures.

**Structural measures can be taken up in the state:**

- **Detention Basins:** The state area has a number of depressions locally called chauras which act as detention basins. These chauras absorb a considerable amount of water of the first flood of the season. No man made detention basins or improvements in natural chauras has been done.
- **Embankments:** All the rivers have been embanked in the state. River Kosi is embanked on both the sides. But there are few gaps in these embankments which reduce its effectiveness. The maintenance and repair of these embankments must be taken into account.

**Conclusion:**

Bihar government must pay heed to the recommendations of the Kosi High Level Committee and the report titled 'Kosi Deluge: The Worst is Still to Come' of the Fact finding mission headed by civil society experts and change its flood policy from trying to arrest rivers to creating more space for them.



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