

Floods in India: A Geographical Perspective

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Abstract: *The main objective of the paper is to provide detailed geographical aspects (meaning, types, causes, & consequences) of flood with reference to India. It highlights the governmental strategies, programs for controlling the flood situations and also stated the role of National Flood Commission and flood forecasting centers for the same*

1. Introduction

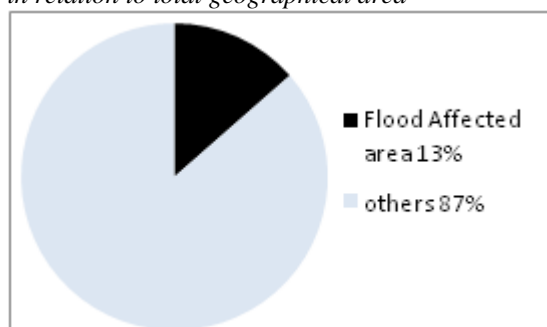
The word 'flood' comes from the English 'flood', word common to Teutonic languages, compare to German 'flut' Dutch 'vloed' form the same root as is seen in flow, float. A flood is an overflow for an expanse of water that submerges land, a deluge. It is usually due to the volume of water within a body of water, such as river or lake, exceeding the total capacity of the body and as a result some of the water flows or sits outside of the normal parameter of the body. Floods probably account for the greatest loss of life and highest degree of material damage among all the natural hazards of the world. In fact flood is a natural phenomenon but it becomes hazardous when it causes colossal loss to human lives and property. About 3.5% total geographical area of the world is covered by flood plain.

2. Types of Floods

There are seven types of floods: periodic floods, flash floods, river floods, coastal floods, seasonal flood, tsunami floods and lake floods. Periodic and seasonal floods are the most predictable. River floods and flash floods are not predictable. They suddenly happen, usually after a big storm or a dam break. Coastal floods are the one which usually makes the most damage, often associated with cyclones.

3. Floods in Indian Context

India is a flood-prone country since long. About 40 million hectares of country's total geographical area is prone to flood out of which 7.5 million hectares (25%) suffer from floods every year. Over 60% of the flood damage in the country occurs from river floods and remaining 40% by other sources. Every year 1.75 million people and 30,000 cattle are adversely affected by the floods. *Percentage of flood affected area in relation to total geographical area*



Source: Drawn by Author

Causes of the floods	Areas affected
1. Heavy rainfall : rainfall concentrated in three Monsoonal greater run-off	West coast of Western Ghat, Assam and sub-himalayan west Bengal, Indo Gangetic plain
2. Cloud bursts : Unusually high amount rainfall within a short time.	Himalayan region, desert and semi desert region.
3. Cyclones : Exceptionally high amount of rainfall accompanied by strong winds and tidal waves	East coast of Tamilnadu, Andhra Pradesh, Orissa and West Bengal.
4. Large Catchment area : Which allows collection of water from a very large area even if the rainfall is not very high.	Catchment area of Ganga and Godavari
5. Rivers not able to drain itself because drainage channels are not developed	Interior drainage regions of Punjab, Rajasthan and Haryana.
because the river is carrying huge amount of silt that blocks its path	Eastern Uttar Pradesh and Northern Bihar by Narayani and Kosi.
because of blocking of flow by landslides	Hilly regions of Himalayas
because of meandering of rivers which impedes drainage	Lower reaches of Gangetic plain and Brahmaputra
Because formation of sand bars have blocked the mouth of the river	Delta areas of West Bengal, Orissa, and backwaters of Kerala
6. Deforestation : Which causes acceleration of runoff and lowering of infiltration.	Siwaliks, Chotonagpur plateau region, and Western Ghats
7. Siltation of the river : Which raises the bed of the river.	Kosi, the Ganga, and Brahmaputra
8. Faulty irrigation practices : That raises the water table and water logging which causes floods.	Punjab, Haryana and Uttar Pradesh

4. Causes of Floods

The causes of floods are both natural as well as man-induced are highly complex and their relative importance varies from place. Among natural factors which causes river floods are prolonged high intensity rainfall, meandering courses of the rivers, extensive flood plains, break in slope in the long profile of the river, blocking of free flow of river water. The anthropogenic factor includes building activity, eventual urbanization, channel manipulation through diversion of the river course construction of bridges, barrages and reservoirs, agricultural practices deforestation, land use changes, etc. It may be pointed out that all these factors never be considered separately because it is the cumulative effects of several factors with ultimately cause severe floods.

5. Consequences

There are many disruptive effects of flooding on human settlements and economic activities. The effects are as follows:

(A) Primary effects

- Physical damage can range anywhere from bridges, cars, buildings, sewer systems, roadways, canals and any other type of structure.
- Casualties-people and livestock die to drowning. It can also lead to epidemics and diseases.

(B) Secondary effects

- Water supplies-contamination of water prevails. Clean drinking water becomes scarce.
- Diseases-unhygienic conditions and Spread of water-borne diseases increases.
- Crops and food supplies-shortage of food crops can be soursed due to loss of entire harvest.

(C) Tertiary effects

Economic-economic hardship, due to e.g temporary decline in tourism, rebuilding costs, food shortage leading to price increase etc, especially to the poor. However, flooding can bring benefits such as making soil more fertile and providing nutrients in which it is deficient. Periodic flooding was essential to the well-being of ancient communities along the Tigris-Euphrates rivers, the Nile, the Indus river, the Ganges and yellow river.

6. Flooding Zones

Most of the flood prone and flood affected areas of the country are located in the northern parts. Mainly in the ganga plains of the states of Uttar Pradesh, Bihar, and West Bengal, the flood hazards and disasters in U.P., Bihar, W.B. and Andhra Pradesh combined together account 62% of the total damages byt floods in the country.

1. **Ganga-Brahmaputra basin:** The states of Assam, West Bengal, Bihar and Uttar Pradesh are the most flood hit areas of the country. The rivers of Brahmaputra, Domadar, Gandak, Gghagra, Ramaganga, Ganga and Yamuna inundate huge areas every.
2. **Mahanadi-Godavari-Krishana-Kaveri Delta Region:**
3. **Rajasthan plain:** The presence of sand dunes and extreme dry condition, the natural we3ll developed drainage is not allowed hear. Consequently, at occurrence of heavy downpours water gets accumulated floods and water logging.

7. Flood Control Programmes and Strateges

Foods result forms an unavoidable combination of metrological conditions and the physical conditions and the physical conditions of the drainage basin. However, man has not yet been able to control cither of these two factors. Firstly, floods are totally unpredictable and magnitude of the maximum probability of flood in a river basin is the least an intelligent question of the hydrologist. Secondly, it is impossible to design flood protective works against the maximum probable food. The ultimate objective of all measures of flood control is the minimization of flood

damage. This objective can be served either by flood protection works or other measures of avoid flood damage. The flood control programmed in India was launched in 1954 after country experienced Wide devastating floods. The control programmed consists of the following three phases :

1. The immediate phase: This goose extends over a period of two years and it includes the collection of Basic hydrological data and execution of immediate flood protection measures like construction of embankments, improvement of river channels and raising of villages above flood level.

2. Short-term phase: This phase lasts next to 4 to 5 years. In this phase there is stress on improvements of surface drainage, establishment of effective flood warning system, shifting of raising villages over flood level, construction of diversion of channels, protective embankments and raised platforms to be used during the flood emergency.

3. Long-term phase: This includes long term measures for flood control like construction of dams and storage reservoirs digging larger channels and taking suitable steps for land use improvement and soil conservation.

8. National Food Commission

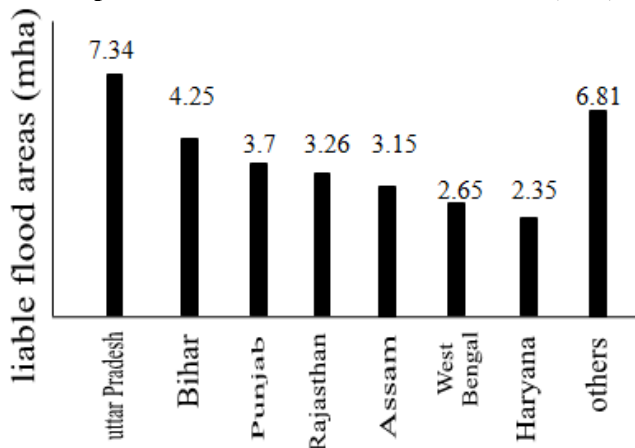
The Rashtriya Bar Ayog (RBA) was constituted in 1976 to develop the long term strategy on control and management of floods. The commission submitted its report in 1980 has assessed that the area liable to floods as 40 million hectares. It was determined by summing up the maximum area affected by floods in any one year in each state during the period from 1953 to1978 for which data was analyzed by the Ayog. This sum has been corrected for the area that was provided with protection at that time and for the protected area that foot affected due of failure of protection works during the period under analysis to arrive the total area to floods in the country. Ayog recommended that there is a need of timely (a) construction of 15,5000 embankments (b) construction of 32,000 km long drainage channels (c) protection schemes for 860 towns and 4800 villages. Recently Brahmaputra river board has constituted it control floods in Brahmaputra valley.

9. Flood Forecasting Centres

The central flood forecasting organization monitors the floods all over the country and issues warnings. It has nine flood forecasting centers located at Surat (taip) Bharamuch (Narmada), Varanasi, Buxar, Patana, Hathidah, Azimabad, (Ganga), Gauhati (Brahmaputra), Jalpaiguri (Tista),Delhi (Yamuna), Delhi (Gomoti), Bhubaneshwar (Subarnarekha Brahamani and Baiterani), Sahibi (Raj) and Gandhi sagar (Chambal). In addition there are 157 flood forecasting stations in operation form where flood forecasts are issued every year.

States	Area liable to floods (Mha)	States	Area liable to floods (Mha)
01. Andhra Pradesh	1.39	12. Manipur	0.08
02. Assam	3.15	13. Meghalaya	0.02
03. Bihar	4.26	14. Orissa	1.40
04. Gujrat	1.39	15. Punjab	3.70
05. Haryana	2.35	16. Rajasthan	3.26
06. Himachal Pradesh	0.23	17. Tamil Nadu	0.45
07. Karnataka	0.08	18. Tripura	0.33
08. Kerala	0.02	19. Uttar Pradesh	7.336
09. Madhya Pradesh	0.87	20. West Bengal	2.65
10. Jammu & Kashmir	0.26	21. Delhi	0.05
11. Maharashtra	0.23	22. Pondichery	0.01
		TOTAL	33.516

Food prone states and their liable flood areas (mha)



Source: Drawn by Author

The following additional measures also suggested for the purpose :

- 1) Restriction on indiscriminate cutting of trees in hilly region and along river banks.
- 2) Massive a forestation and reforestation to protect one km track along the river bank. By initiating Community Action plan throughout the country.
- 3) Regular dredging of river beds.
- 4) Formation of national water board.
- 5) Creation of suitable drainage in water logged areas.
- 6) Effective measures to protect coastal areas and to check sea erosion.

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