FLOODS - The Annual Mayhem in Assam:  
A Technocrat's Viewpoint  
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Basin Physiography and Hydrometeorology:
For the 19 million populations in Assam, where 3/4 of the total number of districts remain under flood water every year, flood is nothing new. It has almost become an annual event of life and at the same time ferocity has increased every year. The two rivers of Brahmaputra and Barak with their tributaries as shown in Fig - 1 drain the valley and bring untold miseries to the people.

The Brahmaputra basin, one of the most flood-prone basins in India, spreads over nearly 58 million hectares covering Tibet, India, Bhutan and Bangladesh. It originates from the great glaciers of Kailash range and traverses nearly 1100 km across Tibet before entering India through Eastern Arunachal Pradesh. In Tibet, it is known as Tsangpo and in Arunachal Pradesh as Dihang or Siang. The river enters the plains of Assam near Pasighat after traversing nearly 226 km of mountainous course. At Kobo, 52 km south of Pasighat, Dihang meets two rivers called Dibang and Lohit. Thereafter it is called the Brahmaputra. This happens to be the only male river in the female-dominated area.
The Brahmaputra has 28 Northern tributaries and 16 southern tributaries. CWC records indicate that the area affected by flood ranges from 4.22 million hectares in 1988 to a low of 0.19 million hectares in 1961. In normal years about 2000 villages are affected. Out of nearly 21995 villages in Assam, the numbers of villages affected by flood are:

- 1982 - 3600
- 1983 - 4403
- 1984 - 4699
- 1985 - 3006
- 1987 - 7290
- 1988 - 8770

With the largest flood, the flood-prone area went up to 62%, which is nearly 75% of the total plain area.

The annual peak waterflow in the river Brahmaputra varies much from year to year. From the records of flow from 1955 - 1970 it ranged from a lowest value of 28000 cumecs to a high of 72000 cumecs as shown in Fig-2.

![Fig-2](image-url)

The peak waterflow in the Brahmaputra varies dramatically from year to year. Between 1955 and 1970, it ranged from a low of 28000 cumecs to a high of 72000 cumecs.

![Fig-3](image-url)

The annual peak waterflow in the river Brahmaputra varies much from year to year. From the records of flow from 1955 - 1970 it ranged from a lowest value of 28000 cumecs to a high value of 72000 cumecs as shown in Fig-2.
Sediment flow in the Brahmaputra is low for low flow stage but tends to rise with increased discharge as shown in Fig-3.

Certain other physical features of the Brahmaputra are noteworthy from the point of view of flood.

Immediately on emerging from the hills the river gradient changes from almost a steep one to a flat one. Near Dibrugarh the gradient is 0.09 - 0.17 m/km. The river travels for 720 km in Assam leaving India near Dhubri to enter Bangladesh.

The journey of the Brahmaputra is through a narrow valley of 80 - 90 km wide. Eastern Himalayan ranges hem the northern end of the valley and the southern end is covered by Patkai-Naga hills, Mikir hills, Khasi and Garo hills.

During the monsoons, the rainfall in the valley ranges from 2480 mm to 6350 mm. Most of the rains occur during May to October.

Brahmaputra watershed is a narrow fern-shaped and the excess rainfall concentrates as runoff in the tributaries and flows into the mainstream of Brahmaputra within a very short time. This enhances the peak flow and flood occurs.

The Barak valley is bound on the north - east and south by North Cachar Hills, Manipur plateau and the Mizo hills. On the west is Karimganj and Bangladesh. Here the rainy season starts in March - April and continues up to October. Rain in the hills creates flood in the tributaries and Barak. Backwater from the tributaries spills banks and creates flood.

**CAUSES OF FLOOD IN ASSAM:**

In Assam, floods result from natural, ecological and anthropomorphic factors. These combined with freak climatic factors like the depression over Bay of Bengal, high transport of sediment (monsoon sediment discharge of the Brahmaputra is nearly 2.12MT of sediments per day), deforestation, shifting cultivation, earthquake and landslide affect the flood discharge.

Physical parameters of a watershed such as drainage characteristics, infiltration, sediment transport and even the stream discharge change with time. These changes are difficult to be monitored continuously and as a result error creeps in often in the flood flow estimation, extreme value analysis and partial series analysis. This partially accounts for inadequate flood drainage provided by the organizations like the Railways by using classical formulae used elsewhere in the country without modification. In addition to the above, the high rate of population increase has forced people to encroach the riverine areas resulting in constricted waterway, reduced conveyance capacity and increased sediment production due to deforestation.

**Wetland destruction:**

Water bodies of sizes smaller than the lakes are called 'Bils' in the Brahmaputra valley and 'Haors' in the Barak valley. 'Bils' provide detention storage for flood water in the valley. Rashtriya Barh Ayog estimated the area under 'Bils' to be 49000 ha in 1988 but a more recent survey estimated that at present 1600 such water bodies cover an area of 35630 ha. All the wetlands which are now existing are in a derelict condition due to encroachment, sedimentation, human interference and many similar reasons. This tends to increase flood discharge.
Meandering / Braiding:
River behaviour, to a large extent, is governed by the geology of the basin and seismic stability. All the valleys of Assam consist of friable rocks and silty earth. The steepness of slope of the riverbed is creating a tendency of the river to both meander and braid. This is aptly shown in Fig-4 which is a satellite photograph of the Brahmaputra riverbed both meandered and braided, creating a situation of unpredictable flood water movement in the valley.

FLOODS AND CONTROL MEASURES:

Unless a specific situation can be predicted, the flood control measures normally change with nature of flood. Floods in Assam showed much lesser magnitude of record prior to 1950 and at that time people welcomed it. Due to this people even thought of living (comfortably?) with flood. Magnitude increased with time and frequency of flood increased. Now in Assam it has almost become an annual event. It is no longer possible to live with this type of flood and hence means to control it were thought of.

In early fifties, Govt. of India proposed embankments as means of controlling flood. Initially, it was a successful measure to combat medium to small floods. In Assam between 1947 and 1954, nearly 200 km of embankment was constructed. By 1988 it has grown to 4000 km. But in 1988 all areas protected by embankments were affected by flood due to breaches. In cases of structures like weirs and dams it is said that new constructions disturb the equilibrium of a river which takes 35-40 years to restore. If we take similar criterion for embankments constructed in the fifties, the equilibrium has reached but from the magnitude and frequency of floods it appears that the equilibrium needs to be disturbed with more and higher embankments. It will be wise to think twice before we embark on such an effort. People now have started feeling that embankments are not good as a flow control measure. Short term and local measures needs to be avoided.

The long term measures taken in Assam uptill now are patchy. Efforts like afforestation, terracing, construction of storage and detention reservoirs, collaboration with the
neighbouring hill states very important without which nothing is likely to succeed. In addition, while going to semi-permanent measures like dams, due consideration is to be given to seismicity, geology etc., of the regions. The riparian rights of the neighbouring countries need active consideration.

'In state of India's environment. A citizen's report 3 on flood, flood plains and environmental myths' published by Centre for Science and Environment mentions policies on Assam floods thus:

"Assamese society is today caught in a vicious cycle where floods consume an enormous amount of human and financial resources for rehabilitation and loss of crop............. results in massive unemployment and destruction. Flood relief and flood control have assumed political dimensions. Politicians both at the state and Centre rarely discuss long term measures. The focus is on short term measures like flood relief. Nearly every year, the Prime Minister visits the affected areas and ad hoc sums of relief are announced. Quick assessments are made by the state governments of damages. The Centre rarely agrees with this assessment. The state invariably starves for fund. The Central Government invariably alleges that the grant is channelized for other purpose".

This is politics of relief. What in-depth study can be expected for a tangible solution of the flood problem of the state? God alone knows.

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2. Report on in visit to Assam to study problems associated with Flooding of Majuli Island.
   By E. F. Muller, Rotary Volunteer.
3. Citizen's report on state of India's environment.
   Floods, Flood plains and environmental myths.
   By Centre for Science & Environment.
4. India's Water Wealth.
   By K. L. Rao.
5. Several paper/reports by the author on the subject.

The author is an educationist and technocrat of eminence. He has held several important posts including Principal of Engineering College of Assam, Director, NERIST and Advisor and Consultant on Technical Education, North Eastern Council, and Govt. of India.