Braiding Process:

The Brahmaputra River in India forms a complex river system characterized by the most dynamic and unique water and sediment transport pattern. The Brahmaputra is the fourth largest river in the world in terms of the average discharge at the mouth and water yield from per unit drainage area of the Basin Rivers is among the highest of the major rivers of the world. High intensity of monsoonal rains, easily erodible rocks, steep slops and high seismicity contribute a lot by rendering the river a heavily sediment-laden one. Amongst the large rivers of the world It is second only to the Yellow River in China in the amount of sediment transport per unit of drainage area. At Pandu the river carries an average suspended load of 402 million metric tons. A river with such gigantic water and sediment discharge magnitudes represents its most dynamic fluvial regime. Its large alluvial channel having a width of 6 to 10km is, therefore, marked by intense braiding, rapid aggradations and drastic bank line changes.

The Brahmaputra is a uniquely braided river of the world. Although braiding seems to be best developed in rivers flowing over glacier outwash plains or alluvial fans, perfect braiding is also found to occur in large alluvial rivers having low slope, such as the Brahmaputra in Assam (India) and Bangladesh or the Yellow River in China. The Assam section of the Brahmaputra River is, in fact, highly braided and characterized by the presence of numerous laterals as well as mid channel bars and islands. The high degree of braiding of the Brahmaputra channel near Dibrugarh and downstream of Guwahati is indicated by the calculated braiding indices of 5.3 and 6.7 respectively for the two reaches following the method suggested by Brice. A braiding Index of 4.8 for the entire Assam section of the river suggests a high degree of braiding of the Brahmaputra channel.

Flood History & Geomorphology:

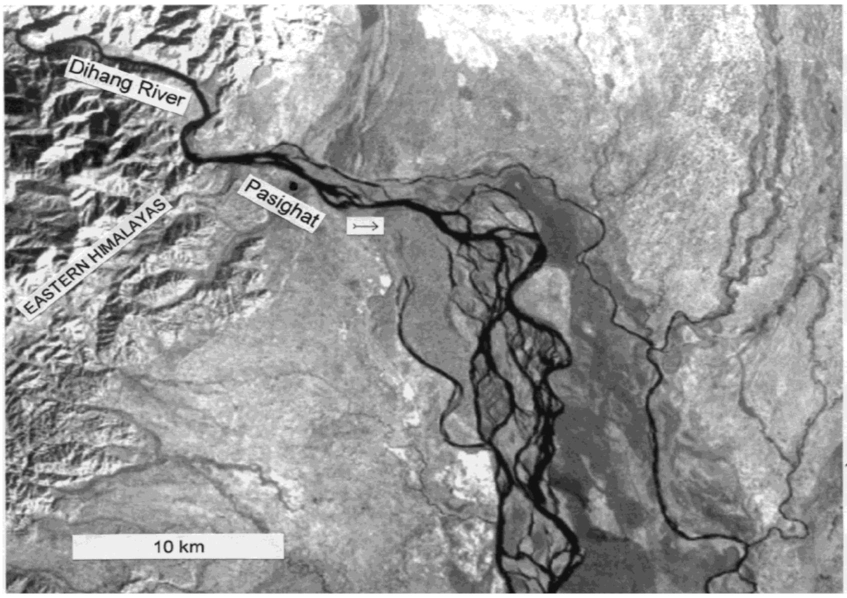
In the Brahmaputra basin of India, flood is almost a regular phenomena. Historically the Brahmaputra valley has been variably inundated by the floods of the Brahmaputra and its tributaries. The first written account of flood in the valley reveals that there was a flood in 1241 in its upper part which caused the Ahoms to leave Majuli and to settle in the area between the Burhi Dihing and Dikhow river. During the reign of Ahom King Sukapha a great flood occurred causing large scale corp damage leading to a famine in 1570. In 1642 also there was a heavy flood on the Brahmaputra in which many cattle were washed away and drowned. Moreover, in the upper Brahmaputra valley there is the record of southward channel shifting of the Brahmaputra as a result of the flood caused by the Dibang River in 1735.

The great earthquake of 1897 (magnitude 8.7 on the Richter scale) was the most severe quake in the history of the Brahmaputra basin and which caused drastic change in the fluvial regime of the valley by suddenly raising the channel beds. After this earthquake there are records of devastating floods that occurred in 1898, 1905, 1907, 1916, 1921 and 1931. In 1950 another great earthquake of magnitude 8.6 on Richter scale occurred resulting in extensive shifting in the beds of the Brahmaputra and its tributaries and consequently the frequency of floods increased. The floods of 1954, 1955, 1956 and 1958 are the glaring examples of floods just after the 1950 earthquake. Occurrence of major floods in the Brahmaputra valley can well be attributed to a host of interrelated factors of natural, hydrometeorological, and anthropogenic origin. While examining the factors responsible for the Brahmaputra floods it is important to note that the Brahmaputra system is so vast and dynamic that the natural process themselves are capable of creating floods in the narrow valley. However heavy monsoonal rains and devastating landslide coupled with easy erodibility of rocks steep slopes and high seismicity constitute the major natural causes of Brahmaputra floods.

The riverine narrow Brahmaputra valley being bordered by the northern, north-eastern and southern hills and highlands is a 720 km long elongated tract with an average width of 80 km of which the river itself covers a width of 6 to 10 km in most of the places. The adverse geographical location and the heavy monsoonal rainfall raining from 2500mm in some places of the valley to 6,350 mm or more in the northern hills, nearly 60-70 percent of which occur during the monsoon period from June to September are responsible for frequent and damaging floods. High intensity of rainfall along the foothills bordering the valley and peaking of tributaries at the confluences within a very short period of time eventually give rise to high flood level of the Brahmaputra. Synchronizing of hydrometeorological factors with flood timing in the Brahmaputra and its tributaries also aggravate the flood situation.

General Morphology

The Brahmaputra River in Assam and extending downstream in Bangladesh is highly unstable. The braided channel is characterized by constant channel shifting a tendency to form avulsion, large scale river bank erosion and flooding. After it exits the confined valley in the mountains of Arunanchal Pradesh, it forms a typical braided channel, initially carrying gravel but mostly sand along the approximately 1000km long course through the open alluvial plains to the confluence with the Ganges in Bangladesh.



Landsat image (April, 1988) around Passighat showing development of braiding where the Dihang river enters India

The Brahmaputra is largely unconfined within the approximately 80km wide Assam plains. Nine natural nodal points have been identified that constrict the river course or limit its natural migration, forcing it to turn. It is widely believed that a major cause of riverbank erosion is the sudden expansion of the river behind these constrictions. However table given below demonstrate that the width upstream and downstream of the nodal points which varies between 6 km to 12 km is independent of the width at the nodal point with no clear trend in the difference between upstream and downstream width. Further study & analysis are highly essential to investigate a number of potential influencing factors of different adjacent nodal points.

Sl. No.	Site	Type of Nodal point bed material	Nodal Point Width	Upstream width	Downstream width
1	Murkong Selek (627)	Clay	4.8	11.7	9.6
2	Near Disangmukh (522)	Clay	5.1	11	10
3	Downstream of Jhanzimukh (495)	Clay	3.75	8	8.4
4	Upstream of Dhansiri (North) (425)	Rock	4	9.9	7.5
5	Downstream of Dhansirimukh at Gamiri (420)	Rock	4.4	11	5.2
6	Upstream of Tezpur (335)	Rock	3.6	5.5	12.3
7	At Pandu near Guwahati (198)	Rock	1.2	11	7.5
8	At Soalkuchi (187)	Rock	2.4	8	10.5
9	Pancharatna (85)	Rock	2.4	8	10.5

Summarizing, the river is still little understood and more research & study is required to develop and improve sustainable and cost-effective management systems, helping to provide a stable environment & Ecosystem for living without disproportionate consequential damages to the environment. More research is required on the relationship between sediment transport rates, sediment inputs caused by large earthquakes and channel widening.