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Topography of the Brahmaputra River and its Tributaries

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Abstract: The Brahmaputra is a trans-boundary river which flows through Tibet, northeast India, and Bangladesh. It is also known as the Yarlung Tsangpo in Tibetan, the Siang/Dihang River in Arunachal, Luit in Assamese, and Jamuna River in Bangladesh. It is the 9th largest river in the world by water discharge, and the 15th longest. With its origin in the Manasarovar Lake region, near Mount Kailash, on the northern side of the Himalayas in Burang County of Tibet where it is known as the 'Yarlung Tsangpo' River, it flows along southern Tibet to break through the Himalayas in great gorges (including the Yarlung Tsangpo Grand Canyon) and into Arunachal Pradesh. It flows southwest through the Assam Valley as the Brahmaputra and south through Bangladesh as the Jamuna (not to be confused with the Yamuna of India). In the vast Ganges delta, it merges with the Ganges, popularly known as the Padma in Bangladesh, and becomes the Meghna and ultimately empties into the Bay of Bengal. About 3,969 km (2,466 mi) long, the Brahmaputra is an important river for irrigation and transportation in the region. The average depth of the river is 30 m (100 ft) and its maximum depth is 135 m (440 ft) (at Sadiya). The river is prone to catastrophic flooding in the spring when the Himalayan snow melts. The average discharge of the river is about 19,800 m3/s (700,000 cu ft/s), and floods reach about 100,000 m3/s (3,500,000 cu ft/s). It is a classic example of a braided river and is highly susceptible to channel migration and avulsion. It is also one of the few rivers in the world that exhibits a tidal bore. It is navigable for most of its length.

Key Words: Mount Kailash, Tibet, Assam, Angsi glacier, Yarlung Tsangpo, Gelling, Majuli Island, Bangladesh, Mansarovar Lake, Angsi Glacier, Gelling, Sadiya, Majuli Island, Chang Tan,

Objectives:

- To document the Brahmaputra river and its tributaries
- To assess the Topographical features of rivers
- To analyse the significance of rivers in relation to Indian civilization
- To provide information for further research

A. Introduction: The Brahmaputra basin spreads over countries of Tibet (China), Bhutan, India and Bangladesh having a total area of 5,80,000 Sq.km. In India, it spreads over states of Arunachal Pradesh, Assam, West Bengal, Meghalaya, Nagaland and Sikkim and lies between 88°11' to 96°57' east longitudes and 24°44' to 30°3' north latitudes and extends over an area of 1,94,413 Sq.km which is nearly 5.9 % of the total geographical area of our country. It is bounded by the Himalayas on the north, by the Patkari range of hills on the east running along the India-Myanmar border, by the Assam range of hills on the south and by the Himalayas and the ridge separating it from Ganga basin on the west. The Brahmaputra River originates in the north from Kailash ranges of Himalayas at an elevation of 5,150 m just south of the lake called Konggyu Tsho and flows for about a total length of 2,900 km. In India, it flows for 916 km. The principal tributaries of the river joining from right are the Lohit, the Dibang, the Subansiri, the Jiabharali, the Dhansiri, the Manas, the Torsa, the Sankosh and the Teesta whereas the Burhidihing, the Desang, the Dikhow, the Dhansiri and the Kopili joins it from left. The major part of the basin is covered with forest accounting to 55.48% of the total area and 5.79% of the basin is covered by

Brahmaputra River

Source: Scroll.in

water bodies. Geologically, the Brahmaputra River is considered one of the youngest rivers in the world. Due to the collision of the Eurasian and Indian tectonic plates, the Brahmaputra valley and its adjoining hill ranges are seismically active. These frequent earthquakes cause extensive landslides, subsidence, and fissuring of the valley as well as lead to a change in the course of the main river and its tributaries. The climate of the Brahmaputra valley varies from severe cold climatic conditions in Tibet to the hot and humid conditions in India and Bangladesh. The Brahmaputra River is also affected by the melting of snow in the higher catchment areas during the early summer months and by the runoff from the monsoon rainfall during the late summer months. The Brahmaputra River is also one of the few rivers in the world that displays a tidal bore. From June to October, during the monsoon season, the Brahmaputra valley is highly prone to flooding. Also, during this period, tropical storms are a common occurrence in the delta region.

The Brahmaputra River is a long transboundary river in the Continent of Asia that flows through the Tibet Autonomous Region of China, India, and Bangladesh. The river originates in the Lake Manasarovar region close to Mount Kailash and then flows for more than 3,969km within the boundaries of the Tibet Autonomous Region, India, and Bangladesh, and finally drains into the Bay of Bengal. The Brahmaputra River is considered the 15th longest river and the 9th largest river in the world by discharge volume. The Brahmaputra River and its tributaries provide significant ecological, cultural, and economic services to millions of people residing in Tibet (China), North-eastern India, and Bangladesh.

<u>B. Book review:</u> 'The Braided River' is the journalist-turned-author and Shillong native's ode to his immediate neighbourhood. The meandering course taken by the Brahmaputra from its points of origin to its final destination in the Bay of Bengal serves as an apposite narrative device, though the author is often at pains to justify inclusions of historical towns and places of interest that aren't quite hinterland but qualify as being on the riverbank only with some latitude. The author flies down to Dibrugarh, takes a houseboat to the edge of the Dibru Saikhowa National Park, where the Siang, Lohit and Dibang meet to form the Brahmaputra, and thereon to the constituent tributaries by road and boat before embarking on a long descent to Upper Assam, Central Assam and Lower Assam all the way down to Bangladesh. While the book pitches itself as travel, memoir and history rolled into one, it is in the latter two that it sparkles most. Not that the author doesn't try capturing the flows in their myriad hues — "uprooted water hyacinth bobbing downriver at pace", "glistening silver line", "muscular ripples" — but one can only wax eloquent so much. In an age where one is constantly told that real travel entails eschewing the beaten track and

seeking the pristine, it isn't difficult to picture the sheer wondrousness of nature untamed without iterations upstream or downstream. What does hook the reader are the intimate pen portraits of towns dotting the river that bring to life their rich pasts, and conversations with bystanders or passers-by as the author courses through his journey. Particularly hilarious are the scenes that ensue after he and photographer Akshay Mahajan, who contributed the bulk of images in the book, crash a funeral gathering at Yinkiong in upcountry Siang mistaking it for the local bar."

"Choudhury isn't above the odd sweeping generalization or two, such as announcing that popular culture in Pasighat (and presumably Arunachal at large) seemed to revolve around television; and the temptation to exercise — likening an old man in a flowing red robe carrying a wooden spear to a figure from Chinese kung fu films. The author, however, deploys his trained journalistic eye to give fuller treatment to reportage that has appeared across time and publications, such as on the boat clinic on the Brahmaputra that caters to people on the river islands, the river dolphins upstream from Tezpur, Makum, Assam's very own Chinatown near Tinsukia town, river island Majuli, the Kamakhya temple in Guwahati, dargahs of Sufi saints Ajan Pir and Ghiyasuddin Auliya in Sivasagar and Hajo, and, of course, the Kaziranga sanctuary. There is a delightful account of life as a manager in a tea estate, with its bungalows and retinue of service staff, a throwback to the days of the Planter Raj. The bits on Ahom history, the Mughal invasions, and events of more recent vintage such as the rise and fall of the United Liberation Front of Asom make for a riveting read. The book is yet another in a long line of academic scholarship and non-fiction that make a fervent plea against damming up the Northeast, a push triggered primarily by a hydropower race with China and as yet unfounded fears about it diverting Brahmaputra water away from the source channels. Choudhury highlights the short shrift given to green compliances, often in the face of protests by locals, in order to fast-track projects that would cut up the Siang, Lohit and Dibang. In a seismic hotspot, the consequences, he points out, could be catastrophic. An associated argument is the need for sustainable development, reviving inland waterways and, given the political will, the natural downstream route into Bangladesh that was severed by the India-Pakistan war of 1965. There have been small beginnings. The author notes New Delhi and Dhaka signing an inland water transit agreement in 2015 that allows Indian cargo boats to access the old pre-Partition routes. A barge with fly ash from Patna entered Assam via Bangladesh three years later. The logical extension perhaps should be a freer movement of people with tighter border patrolling. But in an environment where the National Register of Citizens exercise and the Citizenship Amendment Act has "reopened old wounds... without serving a single useful purpose for anyone", that doesn't qualify as even wishful thinking. Meanwhile, the river will keep rolling." (*Book Review by Abdus Salam, The Hindu*, 30-06-2021) The Brahmaputra is by some margin the largest river in India. After its confluence with the Ganga in Bangladesh, it became the largest in Asia. In The Braided River, journalist Samrat Choudhury sets out to follow its braided course from the edge of Tibet where it enters India down to where it meets the Ganga at a spot marked by the biggest red light district in Bangladesh. Along the way, he meets suspicious Indian spies, gets packed off on the back of a cement truck by soldiers, visits a shelter home for baby rhino and elephant orphans in Kaziranga, and hops from river island to riverside town meeting the locals. The tales of these encounters spice up a story that weaves in the history of the emergence of the border between India and China in Arunachal Pradesh, the formation of the Assamese identity -- a matter of great contemporary relevance owing to the National Register of Citizens and the Citizenship (Amendment) Act -- and the ecological challenges posed by proposed dams. This is a genre-bending book that touches upon several hot-button issues -- environmental, military and political -- as it blends travel, memoir and history with the present.

C. Origin: The headwaters of the Brahmaputra River originate from the 'Angsi Glacier' that is located close to Mount Kailash on the northern edge of the Himalayas, in the Burang County of Tibet Autonomous Region. After originating from its source, the river flows in the eastern direction for about 1,100km passing between the Kailash Range in the north and the main range of the Himalayas in the south. While flowing within the boundaries of the Tibet Autonomous Region, the river is referred to as "Yarlung Tsangpo". It is estimated that in Tibet, the Yarlung Tsangpo river receives about 22 major tributaries. Some of these most significant tributaries are the Raka Zangbo, Lhasa, Xigazê, Nyang River, Nyang Qu, etc. The river then turns to the north and northeast direction, where it flows through a series of narrow gorges formed between the mountainous massifs of Namcha Barwa and Gyala Peri in the eastern Himalayan range. From here, the river turns to the south and southwest direction and passes through the 504 km long "Yarlung Tsangpo Grand Canyon", which is considered as one of the largest and the deepest canyons in the world. After passing through the "Yarlung Tsangpo Grand Canyon", the river crosses the China-India LOC near the Indian village of Gelling and enters the northern region of the Indian State of Arunachal Pradesh. While flowing within the boundaries of Arunachal Pradesh, the river is referred to as "Siang". The river then makes a very speedy plunge from its initial elevation in the Tibetan region and finally emerges in the plains, where it is referred to as "Dihang". The Dihang River then continues its southward journey for about 35 km at the head of the Assam Valley, where it is joined by the Dibang River and the Lohit River. After its confluence with the Lohit River, the Dihang River is referred to as "Brahmaputra", literally meaning, "the son of Brahma", who is one of the Supreme Gods of the Hindus. The indigenous Bodo tribals refer to the Brahmaputra River as "Burlung-Buthur". The Brahmaputra River then enters

the Indian State of Assam, where it meets the Jia Bhoreli/Kameng River in the Sonitpur District. In Assam, the Brahmaputra River is also known by several other names such as 'Luit', 'Bor Luit', 'Siri Luit', Dilao, etc. While flowing within the boundaries of Assam, the width of the river increases to about 20m in some areas. In Assam, the mighty Brahmaputra River flows as a "braided river" for its entire 700km course through the Assam Valley. Here, the river receives several swift-flowing Himalayan streams including Subansiri, Dhansiri, Manas, Bhareli, Champamati, Saralbhanga, Sankosh, Burhi Dihing, Dikhu, etc. The Brahmaputra River has an average depth of 30m and reaches a maximum depth of 135m at the town of Sadiya in Assam. Between the Lakhimpur and Dibrugarh districts of the state, the Brahmaputra River separates into two distinct streams forming the Brahmaputra Channel in the south and the Kherkutia Channel in the north. The two channels join together again about 100 km downstream, resulting in the formation of the Majuli Island, which is considered the largest riverine island in the world.

D. Course of the river: This river flows through three countries – born in Tibet, flowing through India and then on to Bangladesh. It has many names-Tsangpo in Tibet, Lohit or Brahmaputra in India and Jamuna (not to be confused with Yamuna of India) in Bangladesh. The Tibetans believe that long before human occupation, the Chang Tan plateau was covered by the waters of a great lake. A Bodhisattva (an enlightened being) decided the waters had to flow to help people who occupy the region. So he cut an outlet through the The mountains, gorges and jungles through which the Tsangpo flows in Tibet are considered extremely holy. Ancient Tibetan scrolls written by sages speak of sanctuaries or beyuls deep in the Himalayas. Here ageing is slowed down, and animals and plants have miraculous powers. The Tibetans believe that in this area, perhaps through one of the waterfalls at the bottom of the world's deepest gorge, is the doorway to paradise on Earth, Shangri-la. This river flows into India at Arunachal Pradesh and then onto Assam, where it is called the Brahmaputra. In mythological times, Amogha, wife of Sage Shantanu, had a child by Brahma the creator of the Universe. The child took the form of water. Shantanu placed the child right in the middle of the four great mountains – Kailash, Gandhamadana, Jarudhi and Sambwartakka. He grew into a great lake, the Brahmakunda. Parashurama an incarnation of Lord Vishnu, had committed the terrible sin of killing his own mother because his father had ordered him to. So great was the sin that the axe he used got stuck in his hand! The sages advised Parashurama to visit holy places. At Brahmakunda he axed down one side of the mountains, releasing the waters to help the locals. This got the name Brahmaputra or Son of Brahma. To Parashurama's great relief, the axe came loose and the blood from the axe got washed off, leaving a reddish tinge in the river. Hence the name Luit in Assamese (from the Sanskrit word for blood) It is also called Burha Luit, perhaps because 'Burha' meaning old locally represents the ancientness of the river.

Another legend goes on to add that Parashurama used a plough to further furrow the soft soil to make a path for the waters to flow to the plains. Tired, he stopped at a place near Sonargaon. Here his plough or 'Langal' came to a standstill or 'bandh', and this place got called Langalbandh. This is considered to be a very holy place to round off a pilgrimage with a dip in the Brahmaputra.. Alternatively, Balarama, Krishna's brother committed the sin of killing many Brahmins. To wash off his sins, he went on a pilgrimage and visited the confluence of the rivers Brahmaputra and Laskshya. He used his plough to get them to flow and meet yet another river, the Dhaleshwari. As this was the place where the plough stopped, it was called Langalbandh. Interestingly, a dip here during the auspicious days is considered equivalent to many dips in other holy places. The Lohit or Luit or Lauhitya joins the Brahmaputra and the Brahmaputra itself is called by these names in parts of North Eastern India. From India, the Brahmaputra enters Bangladesh. In ancient times it is said, the Brahmaputra came wanting to marry Ganga. To test his love she took on the form of an old woman. When Brahmaputra came he did not recognize Ganga. She got angry and sent him off for ever. Later she allowed the Jamuna to join her.

E. Hydrology: The course of the Brahmaputra has changed continually over time. The most spectacular of these changes was the eastward diversion of the Tista River and the ensuing development of the new channel of the Jamuna, which occurred in 1787 with an exceptionally high flood in the Tista. The waters of the Tista suddenly were diverted eastward into an old abandoned course, causing the river to join the Brahmaputra opposite Bahadurabad Ghat in Mymensingh district. Until the late 18th century the Brahmaputra flowed past the town of Mymensingh and joined the Meghna River near Bhairab Bazar (the path of the present-day Old Brahmaputra channel). At that time a minor stream called the Konai-Jenai—probably a spill channel of the Old Brahmaputra—followed the course of today's Jamuna River (now the main Brahmaputra channel). After the Tista flood of 1787 reinforced it, the Brahmaputra began to cut a new channel along the Konai-Jenai and gradually converted it after 1810 into the mainstream, now known as the Jamuna.(Britannica)

F. Basin: The Ganga and Brahmaputra basin is situated in the northern part of the Indian subcontinent. The basin consists of two large rivers Ganga and Brahmaputra. Brahmaputra basin covers countries like Tibet, Bhutan, India and Bangladesh. The basin of Brahmaputra river is 651334 Km2. In India the river covers the states of Assam, Arunachal Pradesh, Nagaland, West Bengal and Meghalaya. During the monsoon season the basin receives highest rainfall causing floods in the state of Assam. The upper part of the basin lying in Arunachal Pradesh and Nagaland are beautiful valleys and mountain ranges. The climate in the Brahmaputra basin is quite similar to the Ganga basin. There are basically three seasons in the Brahmaputra Basin that are summer, winter and Monsoon. The climate of

the Brahmaputra basin is affected by various factors like the winds from the local mountains and valleys, alternating pressure cells of NE India and Bay of Bengal and the tropical air mass. Summers are hot and dry. Monsoon receives heavy rainfall causing floods and winters are cold. Urbanisation and deforestation in Brahmaputra basin has led to increase in deposit of silt, soil erosion. During the monsoon season the kaziranga national park in Assam usually gets submerged from floods. Massive flooding also causes heavy loss of life, property and financially to the government of Assam. Brahmaputra sub-basin extends over an area of 580,000 sq.km lying in Tibet (China), Bhutan, India and Bangladesh. The drainage area lying in India is 194413 sq.km which is nearly 5.9% of the total geographical area of the country. It is bounded on the north by the Himalayas, on the east by the Patkari range of hills running along the Assam-Burma border, on the south by the Assam range of hills and on the west by the Himalayas and the ridge .separating it from Ganga sub-basin. The sub-basin lies in the States of Arunachal Pradesh, Assam, Nagaland, Meghalaya, West Bengal and Sikkim.

G. Delta: The Ganges and Brahmaputra rivers are one of the largest river systems on the earth. The river channels drain some of the highest mountains present on the planet, the Himalayans. The Ganges River originates near the Tibet/India border, and then flows southeast across India to combine with the Brahmaputra in the country of Bangladesh. The Brahmaputra River has its source in Tibet along the northern slope of the Himalayas, and flows across Assam into Bangladesh. The drainage basin covers an area of 1,664,700 sq km (Figure 42) and the combined length of the two major rivers exceeds 3,900 km. As can be seen the drainage network is exceedingly complicated and highly dense (tributary density = 0.24 km stream length per 500 sq km), one of the highest densities for a large drainage basin. The average elevation in the basin is 1,923 m, with maximum and minimum being 6,033 m and 180 m, respectively. The combined rivers drain both slopes of the Himalayan mountain chain. Paleozoic and Mesozoic, with scattered outcrops of Pre-Cambrian rocks make up the vast majority of the drainage basin. The headwaters are in the West Indian Shield and the Central Himalayan Foreland basins. In the northern part of the basin, mountain grasslands and alpine meadows are the dominant vegetation, while the remainder of the basin is covered by deciduous forests and tropical and subtropical broadleaf forests. Average annual rainfall in the basin is relatively high (1,474 mm) with a maximum of 2,265 mm and a minimum of 341 mm. The rainy months range from June through September when monthly rainfall exceeds 100 mm. The dry months have average rainfall between 20 and 60 mm.

"The Ganges is primarily a meandering river, while the Brahmaputra is primarily a braided channel. 10-i07 is a satellite image of the intersection of the two major rivers, the Ganges on the west and the Brahmaputra on the east. Their average annual combined discharge into the Bay of Bengal is approximately 29,692 m3/sec, with a maximum during flood of 80,984 m3/sec and 6,041 m3/sec during low water periods. The major floods occur during the months from June through September. The image shown in Figure 43 was taken during low water period; during flood season, most of the channel islands are inundated with flood waters. The channels of both rivers are extremely unstable and bank lines can migrate as much as 400 m in a single season (Coleman, 1969). Sediment load is extremely high, with suspended sediment load during flood stage reaching as high as 13 million tons per day (Coleman, 1969). Bedload has never been measured, but is obviously extremely high and consists of fine and medium grained sand. Most of the land in the alluvial valley is cultivated in rice and jute and population density is quite high, with 100 to 500 people per one-half degree area. The delta, one of the largest in the world, covers some 105,640 sq km and has one of the highest population densities of all deltas. Throughout Pleistocene times, the site of active deltaic sedimentation has switched. Today, the Ganges merges with the Brahmaputra, and the site of active sedimentation lies to the east (Plate 10), where large bell-shaped distributaries can be discerned. The major area of abandoned deltaic plain lies to the west and is the site of one of the largest mangrove regions in the world, the Sunderbands. The abandoned delta is approximately 1.6 times the size of the active delta plain. Numerous abandoned channel scars dominate the surface morphology of the abandoned delta plain. These scars are apparently remnants of former courses of the Ganges River and many of its distributaries. Most of the scars indicate that a meandering channel was dominant, now extensively modified by man. Channel scars are of similar size to channels presently active along the Ganges and its distributaries. Many of these former riverine channels are now tidally dominated (10-i01)." (nbr.org)

H. Tributaries: After the Tibetan region, The river then turns southwards around the Garo Hills and enters the plains of Bangladesh. Here, the Brahmaputra River is joined by the Teesta River, which is one of its largest tributaries. After its joining with the Teesta River, the Brahmaputra River separates into two distributary branches. The western branch containing the major part of the river's flow continues its southward journey where it is referred to as the "Jomuna River", which ultimately merges with the lower Ganges or the Padma River at Goalundo Ghat. The smaller eastern branch, which is referred to as "Old Brahmaputra", flows in the southeast direction and joins the Meghna River. The combined flow of the Padma-Jomuna Rivers joins the Meghna River near the district of Chandpur. The three rivers then flow through the delta region to enter the Meghna Estuary and ultimately drain into the Bay of Bengal. The Brahmaputra River alone contributes about half of the total 30,770 cubic meters per second mean annual discharge of the Ganges-Brahmaputra-Meghna River system, making it the world's joint 3rd largest river system in terms of its mean annual discharge. The combined suspended sediment load of the rivers is about 1.84 billion tons per year, which is considered to be the highest in the world. The Brahmaputra River basin is spread over

the four countries of China (Tibet Autonomous Region), Bhutan, India, and Bangladesh, with a total basin area of 580,000 sq. km. Of this entire area, about 50.5% lies in Tibet, 7.8% in Bhutan, 33.6% in India, and 8.1% in Bangladesh. In India, the total drainage basin of the Brahmaputra River is about 197,316 sq. km, which accounts for 5.9% of the entire geographical area of the country. According to a study conducted by IIT Roorkee, the Brahmaputra River, throughout its entire course receives about 22 major tributaries in Tibet, 33 major tributaries in India, and 3 major tributaries in Bangladesh. All the tributaries of the valley area are rain fed and foam up with rain. The precipitation here is mainly due to the South West monsoon. Heavy precipitation occurs here from May to September. All its tributaries experience a number of flood waves as per rainfall in respective catchments. If the flood of the tributaries coincides with the flood of Brahmaputra, it causes severe problems and devastation. The tributaries namely Subansiri, Ronganadi, Dikrong, Buroi, Borgong, Jiabharali, Dhansiri (North) Puthimari, Manas, Beki, Aie, Sonkosh are the main tributaries on the North while the Noadehing, Buridehing, Desang, Dikhow, Bhogdoi, Dhansiri (South), Kopilli, Kulsi, Krishnai, Dhdhnoi, Jinjiran are the main tributaries on the south bank of the river Brahmaputra.

1. Bhogdoi river: The Bhogdoi River is a tributary of the Brahmaputra in India. From its origin in the Naga hills it flows through the city of Jorhat and then it merges with another river and its name becomes Gelabill. The previous name of the river was Desoi. The Bhogdoi river has become heavily polluted over the years. The Bhogdoi River is one of the south bank tributaries of the river Brahmaputra. It originates from Mokokchung in Nagaland where it is also known as Tsujenyong nullah. The river is flowing between Assam and Nagaland. The total catchment area of the inter-state river is 1,545 square kilometers and travels 160 kilometers before joining Dhansiri river near its confluence with Brahmaputra.

2. Buridehing river: Dihing or Burhi Dihing (Dihong means wide river) is a large tributary, about 380 kilometers (240 mi) long, of the Brahmaputra River in Upper Assam in northeastern India. The river originates at 2,375 meters (7,792 ft) above sea level in the Eastern Himalayas (the Patkai Hills) in Arunachal Pradesh and flows through Tinsukia (Tinicukeeya) and Dibrugarh Districts in Assam to its confluence with the Brahmaputra at Dihingmukh. Its watershed covers about 6,000 square kilometers (2,300 sq mi). The Dihing has created a number of oxbow lakes in the area. Namdapha river is a tributary of the Dihing on its northern bank. Disang river is a tributary of the Dihing in its southern bank. The Jeypore-Dehing Rainforest, Namdapha National Park, numerous petroleum fields, wet-paddy fields, bamboo orchards and tea gardens provide a unique landscape along its course. Ledo, Margherita, Digboi, Duliajan and Naharkatia (Nahorkotiya) are the small towns in its valley. Dihing is one of the most important contributors to the Brahmaputra River. The plains of the Dihing Valley have a rich variety of flora and fauna. The Betel nuts are produced most in the areas of the Dihing Plains. is formed by the confluence of the Namphuk and the Namchik, which rises from the Patkai ranges and the Maganton river which is the southern branch of the Noadehing. The Namphuk which may be considered the principal source of the Buridehing. The plains of this sub-basin are very fertile. Almost the entire high land is covered by Tea gardens. The total length of the river Buridehing is 362 km.

3. Champabati river: The Champabati River is a tributary of the Brahmaputra River in the Indian state of Assam. The Champabati River has three sub tributaries - Bhur River (including Mora Bhur River), Lopani and Dhol pani which are originated from Bhutan hills. The Bhur River originates at Gurungdando and flows through Bhur village located in Sidli Tehsil of Chirang district in Assam and after entering into Assam it takes a small river called Patiakhola. Then the Bhur River turned into a narrow sandy form and flows through Manas National Park and arrives at Shantipur and from Shantipur the Bhur river flows in south west direction and entered into Bengtal Sanctuary taking Khungrung River at its right in Hantupara. After Bengtal Sanctuary, the Bhur river flows to south taking the name of Baahbari River. Then the Bhur River flows through the Saalbari Bhurpar and takes two sub-tributaries from phoolkumari River in its both sides and meets Dholpani River and it finally takes the name of Champabati River. The Dholpani river also originates in Bhutan hills and flows in Bhutan-India border before it takes two sub-tributaries Arne Khola river and Tiniabadhi river and finally meets the Champabati river.

4. Lopani river: flows through Chirang forest and takes a tributary from Jhora Beel before it meets the Dholpani river. Dholpani and Lopani meets together and take the name of Champabati river.

5. Dibang river: Dibang River, also known as Sikang by the Adi and Talo in Idu, is an upstream tributary river of the Brahmaputra in the Indian state of Arunachal Pradesh. It originates and flows through the Mishmi Hills in the (Upper) Dibang Valley and Lower Dibang Valley districts. The Dibang originates near Keya pass on the Indo-Chinese border in the Upper Dibang Valley district of Arunachal Pradesh. The drainage basin of the river within Arunachal Pradesh covers the districts of Upper Dibang Valley and Lower Dibang Valley. The Mishmi Hills lie in the upper course of the Dibang which enters the plains at Bomjir, Dambuk etc. Between Bomjir (Nizamghat) and Sadiya the Dibang has a steep river gradient and exhibits braided channel morphology, with its width varying from 4 to 9 kilometres (2 to 6 mi). It often changes its course, resulting in flooding and destruction of cultivable land and forests along its banks. The Dibang, with a total length of 195 kilometres (121 mi), enters the River Lohit north of the Dibru-Saikhowa sanctuary near the Assamese town of Sadiya. The Sisar, Mathun, Tangon, Dri, Ithun and Emra are the major tributaries of the Dibang. The Dibang is also joined by a number of tributaries such as the Airi, Ilu, Imu, Ahi, Ashu,

Epipani and Eze (Deopani) rivers during its course. Most of these rivers join it in the upper course in the hills thus giving it a wide fan shaped catchment region.

6. Dhansiri river: The Dhansiri is a river of Golaghat District of Assam and the Chümoukedima District and Dimapur District of Nagaland. It originates from Laisang peak of Nagaland. It flows through a distance of 352 kilometres (219 mi) from south to north before joining the Brahmaputra on its south bank. Its total catchment area is 1,220 square kilometres (470 sq mi). While flowing as the boundary between Karbi Anglong and Nagaland, it flanks a large wilderness very rich in wildlife. On one side is the Dhansiri Reserved Forest and on the other Intanki National Park. It has several types of important wood bearing trees along its bank like Intanki Forest. Dhansari river along with Kapili by headward erosion has completely isolated the Mikir hills from the Peninsular plateau. There are numerous perennially waterlogged swampy regions locally known as 'bils' associated with this river. rises in the south west corner of Nagaland below the laishiang peak. From its source upto Dimapur, the Dhansiri forms the boundary between the districts of Cachar, Nagaon and Nagaland. Beyond Dimapur, the river enters and flows through the Karbi-Along and GolaghaDigaru is a river originating in the Garo-Khasi hills of Meghalaya state in India, flowing towards the northeast and then meeting the Kopili river and then merging with the Brahmaputra river. The name Digaru originated from a Kachari/Mech word 'Di' which means water and 'Garo' means the people living in the Garo hills. Hence Digaru literally means "water of the Garo". This River is known as Umtru River in Meghalaya. There are 3 dams constructed across this river namely, Umtru Dam, Kyrdemkulai (Umiam st-III) Dam & Nongkhyllem Dam at Ri Bhoi district for hydroelectric power generation.t districts of Assam. The river is nearly 354 km long.

7. Digaru river: Digaru is a river originating in the Garo-Khasi hills of Meghalaya state in India, flowing towards the northeast and then meeting the Kopili river and then merging with the Brahmaputra river. The name Digaru originated from a Kachari/Mech word 'Di' which means water and 'Garo' means the people living in the Garo hills. Hence Digaru literally means "water of the Garo". This River is known as Umtru River in Meghalaya.

8. Dikhow river: The Dikhow River is a left tributary of the Brahmaputra River in the Indian state of Assam. It rises in the Zunheboto district in Nagaland, flows through the Sivasagar district of Assam and joins the Brahmaputra at Dikhowmukh. Notably, the majority of the population residing in Sivasagar district of Assam depends on the waters of the Dikhow River for daily water supply. It is suspected that chemical substances released in the coal mines near the upper reaches of the Dikhow River in Nagaland have resulted in sudden changes of colour of the river waters.

9. Dudhnai river: The Dudhnoi River is a sub-tributary of the Brahmaputra River in the Indian state of Assam. The Dudhnoi river originates in the East Garo Hills of Meghalaya. The Dudhnoi River meets Krishnai River at Matia of Goalpara district and then flows as Mornoi River before its confluence with the Brahmaputra river. Floods in Goalpara district are dictated by the Dudhnoi river.

10. Jaldhaka river: also known as Dichu, a tributary of Brahmaputra is a trans-boundary river flowing through India, Bhutan and Bangladesh with a length of 233 kilometres. It originates from the Bitang Lake (or Kupup Lake) at Kupup, Gangtok District, Sikkim, near the Jelep La pass below Dongkya Mountain Range. It flows through Pakyong District of Sikkim, India and then passes through forests of Samtse District of Bhutan where it flows for around 40 Kilometres and then re-enters India at Bindu, Kalimpong district. Further it passes through West Bengal's cities and towns like Dhupguri, Falakata, Mathabhanga and flows through Kalimpong, Jalpaiguri and Cooch Behar districts in West Bengal, India. Then the river enters Bangladesh at Mogolhat, Lalmonirhat District of Rangpur Division. It is known as Dharla River in Bangladesh and flows through towns like Kolaghat, Phulbari and Kurigram City and Passes southwards until the Dharla debouches into the Brahmaputra River at Bagua Anantpur of Kurigram District. Due to the river's wandering over several international borders, only a small length of the river lies in Bangladesh and Bhutan and most of its path lies in India. In some places, this river is also known as Mansai river and Singhimari river has its origin in Sikkim. It traverses a total distance of 186 km passing through Bhutan, Darjeeling, Jalpaiguri and Cooch Behar districts of West Bengal, before finally joining Brahmaputra near Kurigram district of Bangladesh. The Murti and the Diana are its main tributaries.

12. Jiadhal river: The Jiadhal River is a northern sub-tributary of the Brahmaputra River in the Indian state of Assam. The river originates from the hills of Arunachal Pradesh. The Jiadhal river flows through the Dhemaji district and takes the name of Kumotiya River from Gogamukh. The river finally joins Subansiri river, a major tributary of Brahmaputra River. Jiadhal River is known as 'Sorrow of Dhemaji' for the heavy damage caused by annual flood and erosion. The Jiadhal River spans two states of India: Arunachal Pradesh and Assam. A north-bank tributary of the Brahmaputra, the Jiadhal River originates in the lower Himalayan ranges in West Siang District of Arunachal Pradesh and flows southward through the flood plains of Dhemaji District in Assam in a complex network of channels before meeting the Brahmaputra near Majuli Island. The Jiadhal River catchment covers an area of 1,205 km2, of which 370 km2 (31 per cent) lie in the hills of Arunachal Pradesh and 835 km2 (69 per cent) lie in the plains of Assam. The sub- tropical monsoon climate may be stated as the general climate for the whole catchment, with the upper catchment moist in all seasons, with a harsh winter and shorter summers at higher elevations.

13. Kameng river: The Kameng River (previously named Bharali River, now called Kameng in Arunachal Pradesh and Jiabharali (Jia Bharali) in Assam) in the eastern Himalayan mountains, originates in Tawang district from the glacial lake below snow-capped Gori Chen mountain 27°48′36″N 92°26′38″E, elevation 6,300 metres (20,669 ft), on the India-Tibet border and flows through Bhalukpong circle of West Kameng District, Arunachal Pradesh and Sonitpur District of Assam, India. It becomes a braided river in its lower reaches and is one of the major tributaries of the Brahmaputra River, joining it at Tezpur, just east of the Kolia Bhomora Setu bridge rises from the unsurveyed hills of the Himalayas presumably in the territory of Tibet beyond the AKA & DUFFA Hills. The river kameng flows for 55 km in south westerly direction and then reaches Bhalukpong where it ends its hilly journey. The river is nearly 250 km long (190 km in Arunachal Pradesh and 60 km in Assam). The Kameng river had an important historical significance. During the medieval period i.e. between 13th to early 16th century, it marked the borders between the Chutiya kingdom and the Kamata kingdom. Later, in the 16th century, after the annexation of the Chutiya kingdom by the Ahoms and the downfall of Kamata kingdom, it acted as the border between the Ahom kingdom and Baro-Bhuyan rule.

14. Kopili river: is one of the important major tributaries of the Brahmaputra on its left bank. It originates in the Saipong Reserve Forest situated in south east of Meghalaya and passes through the borders of Meghalaya, North Cachar hills and karbi anglong and enters the plains in Nagaon district of Assam and finally joins the Brahmaputra at Kopilimukh. Its total length is 256 km of which 78 km form the common border of Meghalaya and Assam and the remaining 178 km lie in Assam. The Kopili originates in the Meghalaya plateau and flows through Central Assam and the hill districts of Assam before its confluence with the Brahmaputra. In Assam it drains the districts of Karbi Anglong, Dima Hasao, Kamrup and Nagaon. The river flows for a total length of 290 kilometres (180 mi) and has a catchment area of 16,420 square kilometres (6,340 sq mi). It is noted for several spectacular waterfalls along its course which has several deep gorges and rapids in the 120 kilometres (75 mi) of its flow before debouching into the plains at Nagaon district.

15. Krishnai river: The Krishnai River is a sub-tributary of the Brahmaputra River in the Indian state of Assam. The Krishnai river originates in the West Garo Hills of Meghalaya. The Krishnai River meets Dudhnoi River at Matia of Goalpara district and then flows as Mornoi River before its confluence with the Brahmaputra river.

16. Kulsi river: The Kulsi River is a tributary of the Brahmaputra River in the Indian state of Assam. The river originates from West Khasi Hills of Meghalaya. The Kulsi river is known as Khir River in its origin. After travelling 12 km in Meghalaya, this river then flows through Kamrup district of Assam and is known as Kulsi. The confluence of the Kulsi river with Brahmaputra River is at Nagarbera of Kamrup district, Assam.

17. Manas river: The Manas River (in Bhutan Drangme Chhu) is a transboundary river in the Himalayan foothills between southern Bhutan and India. It is the largest river system of Bhutan, among its four major river systems; the other three are Amo Chu or Torsa river, Wong Chu or Raidak, Puna Tshang Chu or Sankosh. It is met by three other major streams before it again debouches into India in western Assam. The total length of the river is 400 kilometres (250 mi), flows through Tibet, China for 24 km (15 mi), flows in Bhutan for 272 kilometres (169 mi) and then flows through Assam for 104 kilometres (65 mi) before it joins the mighty Brahmaputra River at Jogighopa. Another major tributary of the Manas, the Aie River joins it in Assam at Bangpari. The river valley has two major reserve forest areas, namely the Royal Manas National Park (43,854 hectares (108,370 acres), established in 1966) in Bhutan and the contiguous Manas Wildlife Sanctuary (391,000 hectares (970,000 acres) in 1955 increased to 95,000 hectares (230,000 acres) in December 1985) encompassing Project Tiger reserve, an elephant reserve and a biosphere reserve, which constitutes a UNESCO World Heritage Site declared in December 1985. The basin is bounded by Bhutan range of hills on the North, Pohumara river basin on the East, Champamati river basin on the West and Brahmaputra river on the South. The catchment area extends over an area of 34,160 sq km upto N.H. Crossing. The river enters into plains of Assam near Mathanguri and flows through Manas reserve forest. At Mathanguri, this river bifurcates into two branches, the eastern branch is known as Beki and western branch is known as Manas. The river Manas meets the river Brahmaputra near Jogighopa.

18. Noa Dehing river: Dihing or Burhi Dihing (Dihong means wide river) is a large tributary, about 380 kilometres (240 mi) long, of the Brahmaputra River in Upper Assam in northeastern India. The river originates at 2,375 metres (7,792 ft) above sea level in the Eastern Himalayas (the Patkai Hills) in Arunachal Pradesh and flows through Tinsukia (Tinicukeeya) and Dibrugarh Districts in Assam to its confluence with the Brahmaputra at Dihingmukh. Its watershed covers about 6,000 square kilometres (2,300 sq mi).[2] The Dihing has created number of oxbow lakes in the area. Namdapha river is a tributary of the Dihing on its northern bank. Disang river is a tributary of the Dihing in its southern bank. The Jeypore-Dihing Rainforest, Namdapha National Park, numerous petroleum fields, wet-paddy fields, bamboo orchards and tea gardens provide a unique landscape along its course. Ledo, Margherita, Digboi, Duliajan and Naharkatia (Nahorkotiya) are the small towns in its valley. Dihing is one of the most important contributors to the Brahmaputra River. The plains of the Dihing Valley have a rich variety of flora and fauna. The Betel nuts are produced most in the areas of the Dihing Plains.

19. Pagladiya river: The Pagladiya River is a northern bank tributary of the Brahmaputra River in the Indian state of Assam. The Pagladiya river originates in the Bhutan hills and flows through Baksa District and Nalbari district before its confluence with the Brahmaputra river. Pagladiya River is perennial, very shallow, and is characteristically known for flash floods and high discharge rates. The Pagladiya basin has been developed by the actively migrating nature of the stream and resulted in a basin of complex migration pattern. The relict of the earlier Pagladiya known as Mora Pagladiya (Dead Pagladiya) can still be seen in the form of an abandoned channel passing through Khagrabari and Barama of Baksa District.

20. Puthimari river: The Puthimari River rises in Assam, India. It is a tributary of the Brahmaputra River, the fourth largest in the world.[citation needed] The Puthimari is known for its floods and high sediment load.

21. Sankosh river: Sankosh (also Mo Chu, and Svarnakosha) is a river that rises in northern Bhutan and empties into the Brahmaputra in the state of Assam in India. In Bhutan, it is known as the Puna Tsang Chu below the confluences of several tributaries near the town of Wangdue Phodrang. Wangdue Photrang Dzong overlooking the Sankosh River. The two largest tributaries are the Mo Chhu and Pho Chhu, which flow together at Punakha. The Punakha dzong, which is situated immediately above the confluence of the two rivers, is one of the most beautiful dzongs in Bhutan and the winter residence of the Dratshang Lhentshog. The upper reaches of the Pho Chhu are susceptible to ice blockages, and the dzong has been damaged on several occasions by glacial lake outburst floods. After it enters India, it flows on the border of Assam and West Bengal. At Wangdue Phodrang, elevation 1,364 metres (4,475 ft), the river is joined by the west flowing Tang Chuu and it enters a precipitous gorge. The highway running south from Wangdue Phodrang to Dagana follows the river for much of its course. Near the town of Takshay is the confluence with the west flowing Hara Chhu. The last major Bhutanese tributary is the Daga Chhu.

22. Saralbhanga river: the Saralbhanga River (also called Swrmanga) flows from Sarphang district of Bhutan to Assam in India. About 500 farmers from five villages close to the border contribute to building, repairing and maintaining this check dam on the river, a traditional diversion based irrigation system of the Bodo tribe, which is called the Dongo or Jamfwi system. The Jamfwi or Dongo irrigation system water channels fed by the Sarlabhanga river is the traditional system used for irrigation in Korkrajhar district. The Jamfwi or Dongo irrigation system channels water across the border into India through a labyrinth of small canals to irrigate rice and vegetable farms. Communities on both sides of the India-Bhutan border consume the produce.

23. Siang River: The Siang is the principal constituent river of the Brahmaputra known as Yarlung Zangbo in China. It originates from the glacier mass of the Kailash Range of the Himalayas at an elevation of about 5300 m and flows through China. The river flows eastwards for about 1600 km through the Tibetan Plateau. Before entering India the river Siang or Dihang flows through a deep gorge across the eastern extremity of the Himalayas. The river then flows through Arunachal Pradesh in a south/ south easterly direction for about 230 km to reach Pasighat. Two other rivers viz. The Lohit and the Dibang join the Siang at about 30 km downstream of Pasighat to form the mighty Brahmaputra river. The Siang in its long journey covering different topography has got multiple names, viz, the Yarlung Tsangpo or Zangbo in Tibet, Dihang in the periphery of Arunachal and Assam, the Brahmaputra in Assam, Jumna, Padma, and Meghna in Bengal and Bangladesh. From its sources to the point of entry into Arunachal Pradesh it is called Tsangpo, which means a purifier. And the Siang river, which originates from Angsi glacier on the northern side of the great Himalayas in Burang county of the Ngari prefecture of the Tibet Autonomous Region (TAR), is considered a sacred river by the Adi people because its water is used in the ordeal to purify man's sin and also to punish for guilt. People suffering from all kinds of skin diseases, weakness, and scurvy are advised to take baths in the Siang river to cure their diseases. The Siang is a river of healers, but sadly, in the last more than seven years, the Siang river is flowing with muddy torrents and its water turbidity is very high, and is not fit for bathing and swimming activities. To our deep, agonizing pain, survival of aquatic life in the Siang is in great danger due to the reckless damping of the muck of dams/road construction in the Tibetan region by China in the upper ridges of the Siang river.

24. Subansiri River: The Subansiri rises in the mountains of Tibet. Near its source, a big "Chu" family of streams drain into the main valley. The principal stream belonging to this "Chu" group is the "Sikung chu" which may be considered as the main source of the subansiri. The total length of the subansiri is about 442 km. Out of which 192 km lie in NEFA now renamed as Arunachal Pradesh and 190 km in Assam and the rest fall in Tibet. The Subansiri River (Chayul Chu in Tibet) is a trans-Himalayan river and a tributary of the Brahmaputra River that flows through Tibet's Lhuntse County in the Shannan Prefecture, and the Indian states of Arunachal Pradesh and Assam. The Subansiri is 442 kilometres (275 mi) long, with a drainage basin 32,640 square kilometres. It is the largest tributary of the Brahmaputra contributing 7.92% of the Brahmaputra's total flow. Originally the name applied to the river only after the confluence of the Chayul Chu and Tsari Chu rivers at Gelensiniak. In early maps of independent India, Tsari Chu was marked as the main Subansiri river. However, over time, the name has been transferred to Chayul Chu. Within Tibet, the rivers are named after the locations they flow from such as Loro Chu, Nye Chu, Char Chu and Chayul Chu, all of which apply to the Subansiri or its tributaries. It enters India near the town of Taksing and flows east and southeast through Miri Hills, then south to the Assam Valley at Dulangmukh in Dhemaji district, where it joins the

Brahmaputra River at Jamurighat in Lakhimpur district. Small tributaries of the Subansiri include Rangandi, Dikrong and Kamala. The Subansiri lends its name to two districts in Arunachal Pradesh: Upper Subansiri and Lower Subansiri.

25. Tista river: Teesta River is a 414 km (257 mi) long river that rises in the Pauhunri Mountain of eastern Himalayas, flows through the Indian states of Sikkim and West Bengal through Rangpur, and enters the Bay of Bengal. It drains an area of 12,540 km2 (4,840 sq mi). In India, it flows through Mangan District, Gangtok District, Pakyong District, Kalimpong district, Darjeeling District, Jalpaiguri District, Cooch Behar districts and the cities of Rangpo, Jalpaiguri and Mekhliganj, Rangpur. It joins the Brahmaputra River at Phulchhari Upazila in Bangladesh. 305 km (190 mi) of the river lies in India and 109 km (68 mi) in Bangladesh. Teesta is the largest river of Sikkim and second largest river of West Bengal after the Ganges. is the largest river of North Bengal. It rises in the Himalayas in North Sikkim. Running through narrow gorges for nearly 138 km, it debouches into the plains of the Jalpaiguri district at sevoke. It flows in a steady course upto Jalpaiguri town beyond which it records frequent changes. It joins the Brahmaputra near Rangpur town in Bangladesh after traversing a length of 309 km. In the higher reaches of the river, close to the Tibetan Plateau, the vegetation consists mainly of drought-resistant grasses and shrubs. As the river descends from the higher elevations to the plains, the increased precipitation supports the growth of Sal forests. At the lower reaches, swamps are found. Several species of fish like chital, mrigal, pabda, etc are found in the river waters. The forests along the Brahmaputra River support many notable mammals like the one-horned rhinoceros, elephants, leopards, deer, wild buffalo, and Bengal tigers. The Teesta River originates from Teesta Khangtse Glacier, west of Pahunri (or Teesta Kangse) glacier above 5,400 m (17,700 ft), and flows southward through gorges and rapids in the Sikkim Himalaya. It is fed by streams from Tso Lhamo Lake, Gurudongmar Lake and rivulets arising in the Thangu Valley, Yumthang Valley of Flowers, Dikchu and Donkha mountain ranges. The river then flows past the towns of Chungthang, Singhik, Mangan, Dikchu, Makha where some major tributaries like Kanaka river joins and reaches Singtam, where it is spanned by scenic Indreni Bridge. Also in Singtam, a large tributary of Teesta called Ranikhola joins and then descends towards Bardang, Majitar, Mining where it is spanned by Rangpo - Mining Teesta Bridge and reaches the city of Rangpo where Rangpo River, the second largest tributary of Teesta joins. From here river Teesta forms the border between Sikkim and West Bengal up to Teesta Bazaar via Melli. Just before the Teesta Bridge, where the roads from Kalimpong and Darjeeling join, the river is met by its largest tributary, the Rangeet River.

26. Torsa river: Torsa River (also spelt Torsha and also known as Kambu Maqu, Machu and Amo Chhu) rises from the Chumbi Valley in Tibet, China, where it is known as Machu. Its course continues into Bhutan, India, and Bangladesh before joining Brahmaputra River into the Bay of Bengal. takes its birth in the Chumbi valley of Tibet where it is called Machu. Its upper reaches fall in the territory of Bhutan. It enters Indian territory near Phuentsholing after travelling about 70 km in China and 78 km in Bhutan. It then flows through the districts of jalpaiguri and Cooch Behar in West Bengal and joins Brahmaputra in Bangladesh. The length of the river from its origin to Ghughumari (Cooch Behar) is 222 km having a total catchment area of about 4530 sq km. Thereafter, it meets Raidak-I. From Tibet, Torsa flows into Bhutan, where it is known as the Amo Chu. It has a length of 358 kilometres (222 mi) before entering India, of which 113 kilometres (70 mi) are in Tibet and 145 kilometres (90 mi) in Bhutan. After entering West Bengal in India, it is known as Torsa. In Bangladesh too, it is known by the same name. It is also known as: Chumbi, Am-Chu, Jaldhaka. Afterwards, the river flows past the border towns of Phuntsholing (in Bhutan) and Jaigaon, and Hasimara (in India) and past the tea estate of Dalsingpara and the Jaldapara National Park. Ghargharia river meets with Torsa in the Tufanganj subdivision, near Deocharai and Balarampur. Torsa meets with Kaljani and then flows into Bangladesh by the name of Kaljani and meets with Brahmaputra in BD. A distributary known as Buri Torsa meets Jaldhaka.

I. Floods: During the monsoon season (June–October), floods are a very common occurrence. Deforestation in the Brahmaputra watershed has resulted in increased siltation levels, flash floods, and soil erosion in critical downstream habitat, such as the Kaziranga National Park in middle Assam. Occasionally, massive flooding causes huge losses to crops, life, and property. Periodic flooding is a natural phenomenon which is ecologically important because it helps maintain the lowland grasslands and associated wildlife. Periodic floods also deposit fresh alluvium, replenishing the fertile soil of the Brahmaputra River Valley. Thus flooding, agriculture, and agricultural practices are closely connected. The effects of flooding can be devastating and cause significant damage to crops and houses, serious bank erosion with consequent loss of homesteads, school and land, and loss of many lives, livestock, and fisheries. During the 1998 flood, over 70% of the land area of Bangladesh was inundated, affecting 31 million people and 1 million homesteads. The 1998 flood which had an unusually long duration from July to September, claimed 918 human lives and was responsible for damaging 16 00 and 6000 km of roads and embankments respectively, and affecting 6000 km2 of standing crops. The 2004 floods, over 25% of the population of Bangladesh or 36 million people, were affected by the floods; 800 people died; 952 000 houses were destroyed and 1.4 million were badly damaged; 24 000 educational institutions were affected including the destruction of 1200 primary schools, 2 million governments and private tube wells were affected, over 3 million latrines were damaged or washed away, this increases the risks of waterborne diseases including diarrhea and cholera. Also, 1.1 M ha of the rice crop was submerged and lost before

it could be harvested, with 7% of the yearly aus (early season) rice crop lost; 270 000 ha of grazing land was affected, 5600 livestock perished together with 254 00 poultry and 63 MT of lost fish production. (Avijit Gupta, 2008)

More than 70% of large deltas are under threat from rising sea levels, subsidence and anthropogenic interferences, including the Ganges–Brahmaputra–Meghna (GBM) delta, the Earth's largest and most populous delta system. The dynamic geomorphology of this delta is often overlooked in assessments of its vulnerability; consequently, development plans and previous management investments have been undermined by unanticipated geomorphic responses. In this Review, we describe GBM delta dynamics, examining these changes through the Drivers–Pressures–States–Impacts–Responses framework. Since the early Holocene, the GBM delta has evolved in response to a combination of tectonics, geology, changing river discharge and sea level rise, but the dynamics observed today are driven by a complex interplay of anthropogenic interferences and natural background processes. Contemporary geomorphic processes such as shoreline change, channel migration, sedimentation and subsidence can increase flooding and erosion, impacting biodiversity, ground and water contamination and local community livelihoods. Continued disturbances to the GBM delta, such as curtailing sediment supplies, modifying channels and changing land use, could have a more direct influence on the future geomorphic balance of the delta than anthropogenic climate change and sea level rise. In order to contribute to long-term delta sustainability, adaptation responses must therefore be informed by an understanding of geomorphic processes, requiring increased transdisciplinary research on future delta dynamics at centennial timescales and collaboration across all governing bodies and stakeholders. (nature.com)

The meteorological conditions in catchments of Brahmaputra in Tibet and in India are different and lie in different climatic zones. The mean annual rainfall over the entire catchments including Tibet and Bhutan is about 2500 mm. The rainfall in Brahmaputra basin is mainly due to South-West monsoon and out of total annual rainfall, 85% occurs during the monsoon months from May to September. Besides, the valley gets a good amount of rainfall in the months of April and May due to thunderstorm activities which account for flooding during heavy rain in June, when the soil is already saturated and the river bank is in full stage. The Brahmaputra Valley has an average width of about 80 Km. The main river of the valley, Brahmaputra is one of the largest rivers in the world and rank fifth with respect to its average discharge. The river originates from the Kailash ranges of Himalayas at an elevation of 5300 M. After flowing through Tibet it enters India through Arunachal Pradesh and flows through Assam and Bangladesh before it joins Bay of Bengal. The catchment area of Brahmaputra in Tibet is 2, 93,000 Sq. Km; in India and Bhutan is 2,40,000 Sq. Km and in Bangladesh is 47,000 Sq. Km. The Brahmaputra basin extends over an area of 5,80,000 Sq. Km up to its confluence within Bangladesh. The average width of Brahmaputra is 5.46 Km. The maximum discharge of Brahmaputra at Pandu near Guwahati was recorded as 72,779 cumec on 23.08.62 and minimum discharge was recorded as 1757 cumec on 22.02.63. The average annual discharge is about 20,000 cumec and average dry season discharge is 4,420 cumec. The river slope is very steep till it enters India. A drop of about 4800 M is achieved in a length of about 1700 Km in China (Tibet). This average slope of about 2.82 m/Km gets reduced to about 0.1m/Km in Assam valley. Due to this sudden flattening of river slope, the river becomes braided in nature in the Assam valley. During its course in Assam valley from Kobo to Dhubri the river is joined by about 20 important tributaries on its North bank and 13 on its South bank. Joining of these tributaries bringing high sediment load activates braiding. The Brahmaputra Valley is a region situated between hill ranges of the eastern and northeastern Himalayan range in Eastern India. The valley consists of the Western Brahmaputra Valley covering the regions of Goalpara and Kamrup; the Central Brahmaputra Valley region covering Darrang, Nagaon and the North Bank and Eastern Brahmaputra Valley comprising districts of Sonitpur, Lakhimpur, Dibrugarh and Sibsagar. The Teesta River in North Bengal also drains into the Brahmaputra River. The Brahmaputra Valley has a total area of 71,516 km² with containing 30 districts. Brahmaputra Valley with its rainforest-like climate contains some of the most productive soils in the world. The Brahmaputra River flows from Assam to Bangladesh where it meets the Ganges River to form the world's largest delta and finally flows into the Bay of Bengal in the south.

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