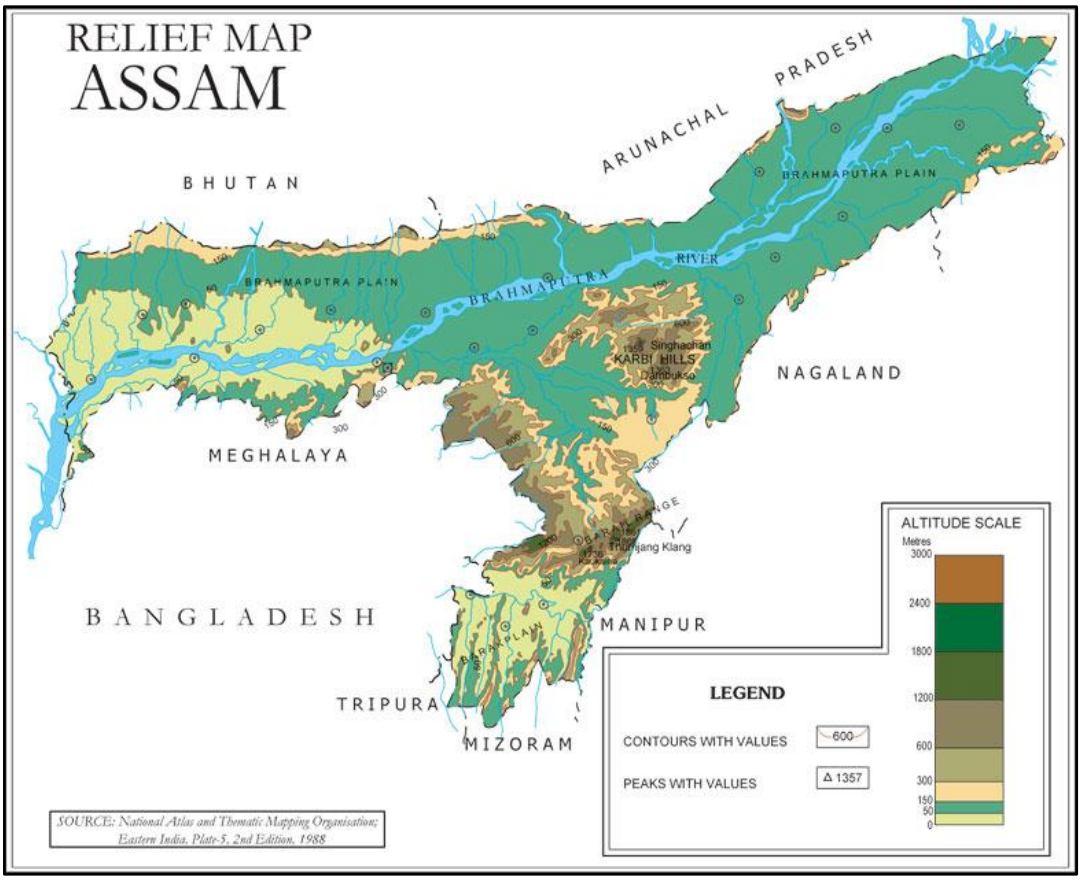
Chapter 2

PHYSIOGRAPHY OF THE STUDY AREA

This chapter deals with the various environmental and physiographic aspects of the study area which determine the cultural landscape of the selected region. The present Assam region is mainly a flat plain land surrounded by hillocks, and lies between 25°44′ and 27°55′ N latitude and 89°41′ and 96°02′E longitude. It is the eastern continuation of the great plains of India and has a well-demarcated physical unit. On the south-western side, it is bordered by Garo, Khasi, and Jaintia hills and on the south, there lie Mizoram and Tripura. Its south-eastern part is defined by the Naga and Patkai ranges. While Arunachal Pradesh (earlier known as North-East Frontier Agency) lies in the north, to the north-west there are the Bhutan hills. It covers an area of about 56,274 square km. According to Kakati (1941), the word Assam is derived from the Sanskrit word *asama* which means 'pearless' or 'unequalled', while Barua (1951) holds that it comes from the word *Ahom*, a ruling class of the region that originally belonged to China. While Baden Henry Powell (1896) mentioned that most probably the name Assam came from the Bodo 'Ha-com' which means low or level country. Topographically the entire valley is bounded by mountainous ranges and is divided into Riverine topography (altitude of 150 m AMSL), Midland topography (altitude ranging from 150 m to 750 m AMSL) and Highland topography (altitude ranging from 750 m to 6554 m AMSL). The Brahmaputra River Valley and the western part of Barak Valley comes under Riverine topography whereas the areas adjoining the Meghalayan plateau comes under Midland topography. The highland topography covers all the hill districts of Assam, i.e., Dima Hasao and Karbi Anglong.



Map 2.1: The relief map of Assam (Source: National Atlas and Thematic Mapping Organisation; Eastern India, Plate-5, 2nd Edition, 1988)

2.1 Geology

Geologically, the present Assam region occupies a unique position amidst complex characteristics. The rocks that make up Assam extend in age from early Proterozoic to the present-day alluvium (Dasgupta and Biswas, 2000). Following are the prominent geological features of the region:

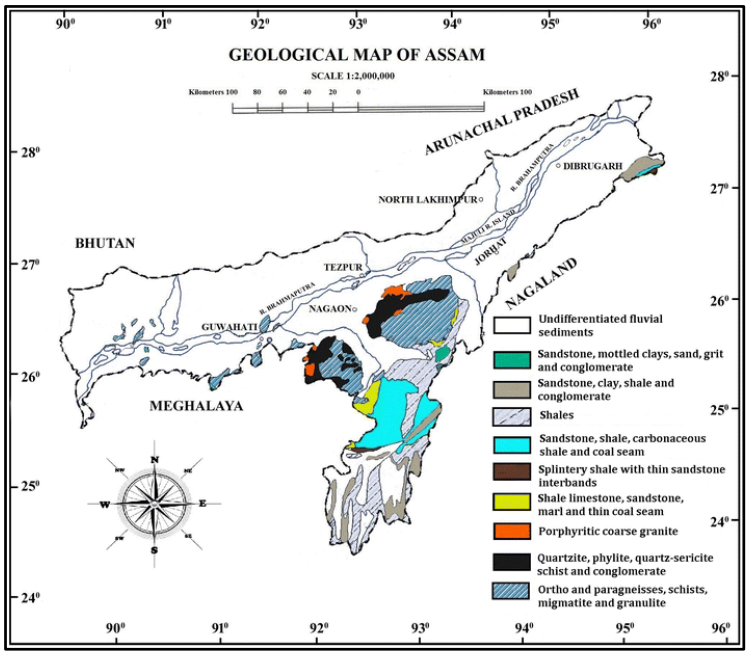
- The alluvial plains of Brahmaputra River (Both recent and Pleistocene)
- Pre-Cambrian deposits in certain areas close to the Meghalayan plateau
- Tertiary deposits in the hilly region of Assam (Karbi-Anglong and Dima Hasao (earlier North-Cachar hill district) adjoining another southern region of the north-east.

Beginning with the older Archean Proterozoic age, the rocks of the Gneissic complex are exposed in Assam near the Meghalayan plateau and extend up to the central part of the state. This complex is made of metamorphic rocks and dates back to around 500 million years. This complex includes the areas of Goalpara, Kamrup (adjacent to

Meghalaya), the hills of Dima Hasao district (some parts of Nagaon and Mikir hills or the current Karbi-Anglong district. The Shillong group, which is palaeo-meso-proterozoic in age and consists of quartzite, phyllite and schist conglomerate, can be found in the northern parts of Dima Hasao hill district and the western and northern parts of Mikir hills. The Permo-carboniferous lower Gondwana group of lithology is found in the extreme western corner of Assam, an extension of the Meghalayan border, and consists of very coarse to coarse-grained sandstone with conglomerate lenses. There are two complexes: Alkali and Sylhet traps of Cretaceous age and are found in the Matikhola parvat area of Mikir hills, where the lithology consists of Pyroxenite serpentine, implying that a volcanic episode occurred in the area. The lithology of the Sylhet trap, namely basalt and rhyolite, is highly weathered towards Assam. Several group formations occurred in Assam and neighbouring areas during the Tertiary period. During the Palaeocene–Eocene age and Jaintia group, there are three formations: Kopili, Shella, and Langpar, each with its own lithology of sandstone and shale, fossiliferous limestone, and sandstone–limestone. These formations are restricted to the North-Cachar hills, extending up to the southern and eastern slopes of the Mikir hills and parts of the Meghalaya hills. The Eocene–Oligocene Disang group is composed of dark grey shale and thin sandstone that is exposed in the central part of North-cachar hills up to the Dhansiri valley. The Barail group belonging to the same period contains three formations: Renji, Jenam and Laisong, which contain massive bedded sandstone, carbonaceous shales and flaggy compact sandstones towards the Upper Brahmaputra valley. These groups are overlain by the Surma group of Miocene age, basically found in Barak (Surma) valley and parts of Dima Hasao district extending to areas of Mikir hills. There are two formations, Bokabila and Bahuban, the lithology of which consists of sandy shale, mudstone, ferruginous sandstone and thin conglomerate sandstone, respectively.

Two groups, Dupitala and Tipam of Mio-Pliocene age of Tertiary period, which are divided into four formations, i.e., Dupitala and Namsang (Dupitala group) and Girujan and Tipam (Tipam), are basically found in Cachar and Karimganj districts of Barak (Surma) valley and Upper Brahmaputra valley. These groups form a good thickness overlying the Surma group of Miocene age, which varies from 800 m to 3300 m. The 900 m thick Dihing formation, which is essentially a fluvial deposit and is part of the Pliocene Dihing group, is composed of pebble-bedded soft sandstone, clay and grit. The

upper Brahmaputra valley areas are where the Dihing and Namsang formation (Dupitala group) are exposed, with the former formation sitting on top of the latter. The Siwalik group of Plio-Pleistocene age is exposed beneath this Dihing group and has two formations: Kimin and Subansiri. Sandstone with clay stone and micaceous sandstone, respectively, make up their lithologies. Sonitpur District of Assam and the foothills of Arunachal Pradesh are where this group of lithology is exposed. The Brahmaputra basin and portions of the Barak (Surma) valley are where one can find the majority of Quaternary sediments, which are in the form of both older and newer alluvium. This group's lithology consists of pebbles, boulders, gravel, sand and clay. Below the more recent alluvium of Holocene age, the middle to upper Pleistocene older alluvium sediments is exposed or buried.



Map 2.2: Geological base map of Assam (Modified from Geological Survey of India)

2.2 Mountain Ranges

The Assam range is a series of hills lying between 24°58´and 25°48′ N and 89°49´and 94°50′ E, which runs from the east to the west between the valleys of Brahmaputra and Surma. It consists of the Garo, Khasi and Jaintia, Dima Hasao and Naga hills. At its eastern end, the range trends towards the north and connects to the Himalayan system through the Patkai range and to the Arakan Yoma through the mountains of Manipur. The general elevation is from 914 to 1829 metresbut at Japvo in the Naga hills, it reaches a height up to nearly 3048 metres. Parts of the hills of Dima Hasao District are

known as the Shillong plateau and form the majority of a great mass of gneiss. Through the greater part of their length, the hills take the form of sharply serrated ridges covered with dense forests (*Imperial Gazetteer*, 1909).

The Barail range of hills in Dima Hasao district of Assam running east to west between 25°5'and 25° 20'N and 92° 32' and 93° 29' E and connecting Naga and Jaintia hills, is composed of soft greenish sandstone with sharply serrated ridges and is covered with dense forest and bamboo jungles. Several of the peaks are nearly 1829 metresin height. The Barail series is divided into three stages, namely Laisong, Jenam and Renji, from the oldest to the youngest (Dutta, 1979). The Jatinga River makes its way through these hills to the Barak valley (*Imperial Gazetteer*, 1909).

The Mikir hills tract of hilly country in Nagaon and Sibsagar districts of Assam lies between the Assam range and the Brahmaputra valley, about 26°30´ N and 93°30´ E. It is cut off from the main mountain system by the valleys of the Dhansiri on the east and the Kapili and its tributaries on the west. The Northern hills are composed of gneissic rocks which towards the south are overlain by sedimentary strata of Tertiary origin. The hills have steep slopes with intervening valleys covered with dense jungle (*Imperial Gazetteer*, 1909).

2.3 Soil

The soil of Brahmaputra and Barak valley is basically alluvial in nature, although there are some patches of red loamy and laterite soils. The hill districts and the surrounding hilly region has mixed red and black soils along with the similar soil to that of the valleys mentioned (Singh, 1987). The major soil group found are mentioned by Gopalakrishnan (2000) as follows:

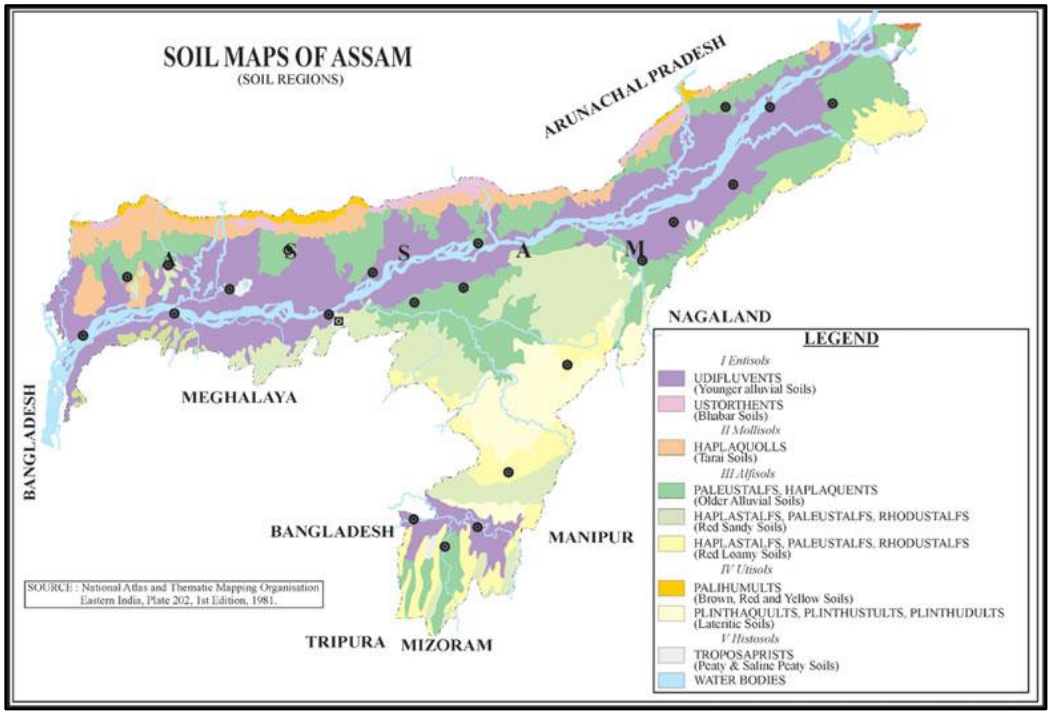
a) New alluvial soil: The recent alluvial soils are particularly deposited by the Brahmaputra River and its tributaries and all the plain districts of Assam come under this group. The texture of the top horizon of this soil is sandy loam or salt loam. The texture is lighter at depth, less acidic and often neutral or slightly alkaline.
b) Old alluvial soil: The older riverine deposits of the Brahmaputra and its tributaries form this group, which is mainly found in the Upper course of Brahmaputra valley. The ground water level is generally deeper than the new

alluvial soils. The texture and surface of the soil range from sandy loam, loam silty–clay loam to silty clay–clay acidic in reaction.

c) Old mountain alluvial soil: The Meghalayan foothills of Goalpara and Kamrup, Naga foothills of Dibrugarh and Sibsagar, foothills of Karbi Anglong and Dima Hasao and in the districts of Nagaon have old mountain alluvial soil. These areas are surrounded by Brahmaputra River on one side and hills on the other. These soils are formed by alluvial materials washed down from the hill slopes and are heavy in texture. The surface soils are compact, very sticky and very plastic.

d) Non-laterised red soil: This kind of soil is mixed red and black soils, which occupy the top sequence in some parts of the hill districts of Karbi-Anglong and Dima Hasao district. Red soils are found on the higher elevation while the black soil is found in the lower elevation. The occurrence of the black soil on the lower topography may be due to the deposition of red soil of higher topography which became black under impeded drainage condition with the presence of iron.

e) Laterised red soil: These soil types can be found in both highland areas and mountain valleys. Some parts of Guwahati, Dima Hasao and Karbi-Anglong hills have these kinds of soil formation.



Map 2.3: Soil Map of Assam (Source: National Atlas and Thematic Mapping Organisation; Eastern India, Plate-202, 1st Edition, 1981)

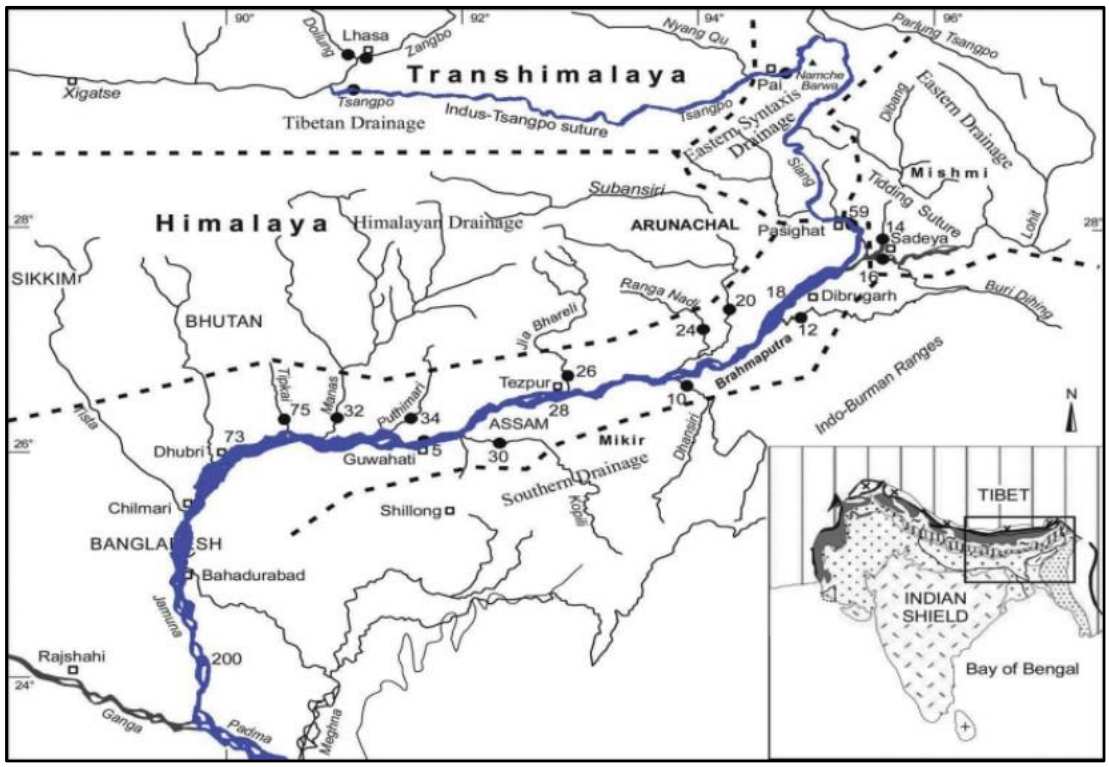
2.4 Drainage

The valley areas of Assam are mainly drained by Brahmaputra River (Himalayan River System), which originates from the Aangsi glacier of the Himalayas in Tibet, where it is also known as Yarlung Tsangpo. The river enters India through Arunachal Pradesh where it is known as Dihang. In the eastern part of Assam, Lohit River joins Dihang, which then drains the entire length of Assam flowing westward collecting the waters from a number of tributaries en route. In the western part, Manas River joins Brahmaputra before it enters Bangladesh and finally falls into the Bay of Bengal. It runs between sandy banks forming numerous divergent channels heavily laden with silt. The river has more than 35 major tributaries. The main tributaries to the north or the right tributaries are Subansiri, Bharali, Barnadi, Pagladia, Manas, etc.,while some of the south tributaries are Lohit, Dihang, Burhidihing, Disang, Dikhou, Dhansiri, Kopili, Digaru, and Krishnai.Many of the tributaries are themselves large rivers with sizeable catchment areas. The north tributaries come from a heavy rainfall region and pass through the fragile and unstable Himalayan mass with steep slopes. All the southern tributaries are relatively stable and reach the main river with nearly negligible slopes, carrying lower sediment loads (Gopalakrishnana, 2000). Most of the tributaries, like the main river, have curved out magnificent gorges through their Himalayan courses. Floods are an annual occurrence and are means to agriculture and settlement in the valley (Singh,2016). Most of the southern tributaries originate in heavy rainfall areas of Khasi and Garo hills of Meghalaya plateau, Karbi-Anglong hills and Nagaland and create floods in the southern plain; however, compared to the north bank tributaries these form fewer meandering courses.

Another important river valley of the region is formed by Barak River, which is a tributary of the Ganga–Brahmaputra–Meghna system and the second most important drainage system in the region. It originates in the upper reaches of Nagaland–Manipur border, 19 km east of Mao, from the slopes of the mountain ranges. Before reaching Nagaland–Manipur boundary, this river turns in various directions and receives the waters of its tributaries such as Kozeri Lok, Majatki Lok and Majatkoi Nodi. It cuts across the Kala Naga range and flows to Tiapi much, marking the tri-junction of Assam, Manipur and Mizoram. From Tiapi much, the river flows through hills and enters the Cachar plains at Lakhipur. After flowing through the Cachar plains via Silchar and Badarpur upto Bhanga, it bifurcates into Surma and Kushiara. The Surma enters

Bangladesh and Kushiara continues to flow through Karimganj District before entering Bangladesh. The plain is created by both aggradational and degradational activities (Gopalakrishnan, 2000).

The rivers of North-Cachar hills mostly originate from the Barail range which drains the hill district and joins the confluences in the plain district of Cachar. Important rivers are Jatinga, Langting, Mahur and Doyang. Jatinga river bed is full of gravels. Langting and Mahur is a tributary of the Doyang which originates at Barail range and flows for approximately 152 kmtill its confluence with Doyang. The bed is rocky and full of pebbles and boulders and at some places hardrock (Dutta, 1979)



Map 2.4: Brahmaputra River and its Tributaries
(Source: http://www.indiawaterportal.org/articles/coping-floods-and-erosion-brahmaputra-plains)

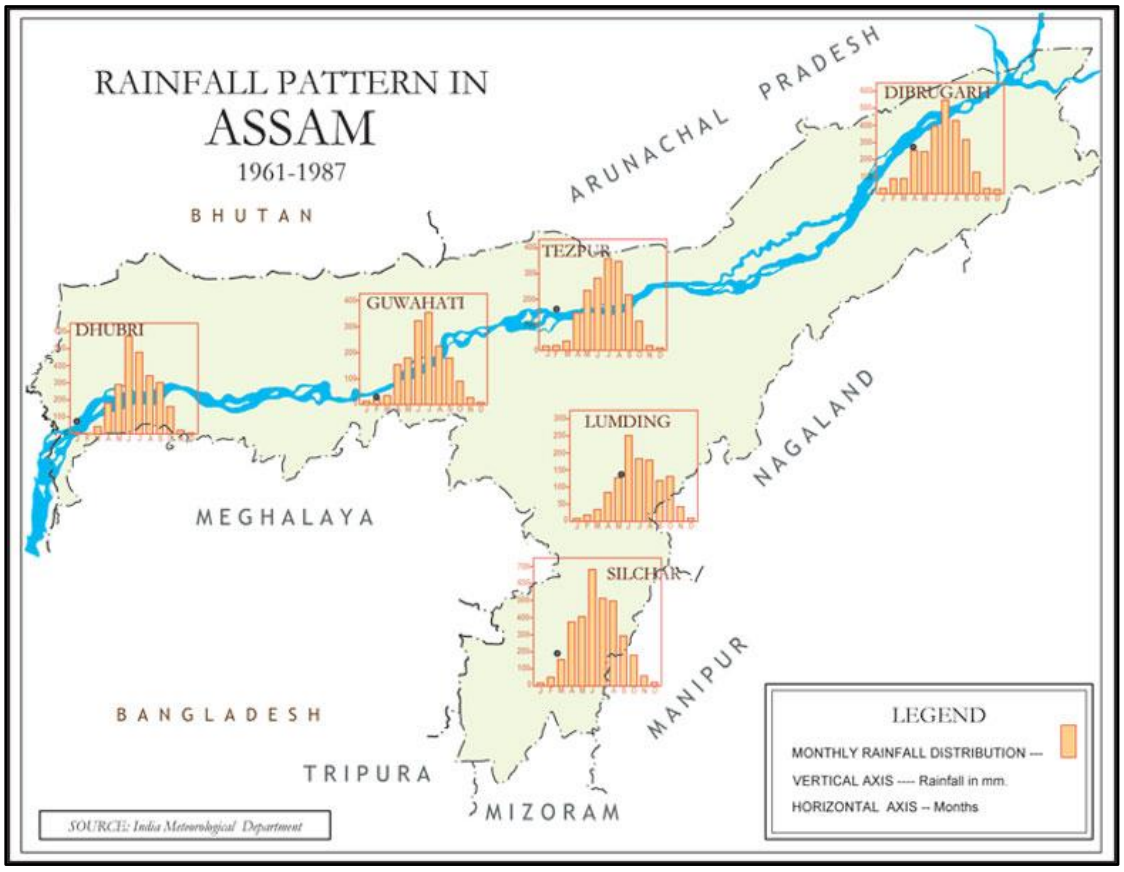
2.5 Climate

The region's climate has been dominated by five factors: Orography, the alternate pressure cells of north-west India and the Bay of Bengal, the predominant maritime tropical air mass, the periodic western disturbances, and the local mountains and valley winds (Singh, 2016).

This region is characterized by sub-tropical humid climate. The normal date of onset of monsoon is 1st June and the major rainy season stretches up to August; however, there

is no complete withdrawal of monsoon. The climate of the region is generally referred to as tropical rainforest and moist subtropical with winter. The average annual rainfall of the valley ranges from 150 to 250 cm in most parts, while in the areas adjoining the lower Himalayas in Arunachal Pradesh in the north and the Meghalayan plateau, it is over 250 cm annually.

- Zone of heavy rainfall includes the sub region of Dibrugarh, Lakhimpur, Sibsagar (upper course of the Brahmaputra Valley), Dhubri, Goalpara and Kokrajhar (lower course of the Brahmaputra Valley) as well as Cachar and Karimganj (Barak Valley).
- Zone of medium rainfall includes the sub regions of Kamrup (Lower Brahmaputra Valley); Sonitpur, Darrang, Nagaon (Central Brahmaputra Valley); Golaghat (Upper Brahmaputra Valley) and Karbi Anglong (Mikir hill region).
- Low rainfall zone includes the areas adjoining the Meghalayan plateau (the rain shadowed areas) (Gopalakrishnan, 2000).



Map 2.5: Map showing rainfall pattern in Assam (Source: India Meteorological Department)

Temperature is highest in the month of July during the periods of south-west monsoon with abundant rains heralding a highly humid weather, which varies according to locations (Gopalakrishnan, 2000). Most of the areas experience an annual temperature that ranges between 22.5–25.0 degree Celsius and the hill districts (Karbi-anglong and Dima Hasao) experiences 20.0–22.5 degree Celsius.

Based on temperature, rainfall and wind, the region experiences four distinct seasons in the year (Singh, 2016). Although there is a broad climatic homogeneity throughout the valley, there are considerable local variations in rainfall, range of temperature and other aspects. The seasons are:

- Winter (Dry) season (December to February): This season is characterised by cool weather with frequent morning fog. Temperature goes down to 12°–5.5°C. The eastern plain districts are cooler than the western plain districts.
- Pre-monsoon or summer (Early March to May): This season is characterised by gradual increase in temperature with occasional thunder showers, locally called '*Bordoisila*'. The average temperature is 23° C.
- Monsoon (June to September): Very heavy rainfall is experienced during this period. The south-west monsoon wind from the Bay of Bengal is first encountered and wind moisture is released. At the low level, due to raised pressure gradient, a local low pressure is created in Khasi and Garo hills, which extends to the Mikir hills.
- Retreating monsoon (October to November): This season is characterised by fair weather and morning fog of short durations. Temperature gradually falls with advance of the season and rainfall decreases (Gopalakrishnan, 2000).

The state normally receives 2 percent of the total rainfall in the winter season (January–February), 25 percent in the summer season (March–May), 65 percent in the monsoon season (June–September) and 7 percent in the post-monsoon season (October–December). However, Assam is prone to floods and sometimes there is also the presence of drought-like situations with the lack of rains (Economic Survey of Assam report, 2016-17).

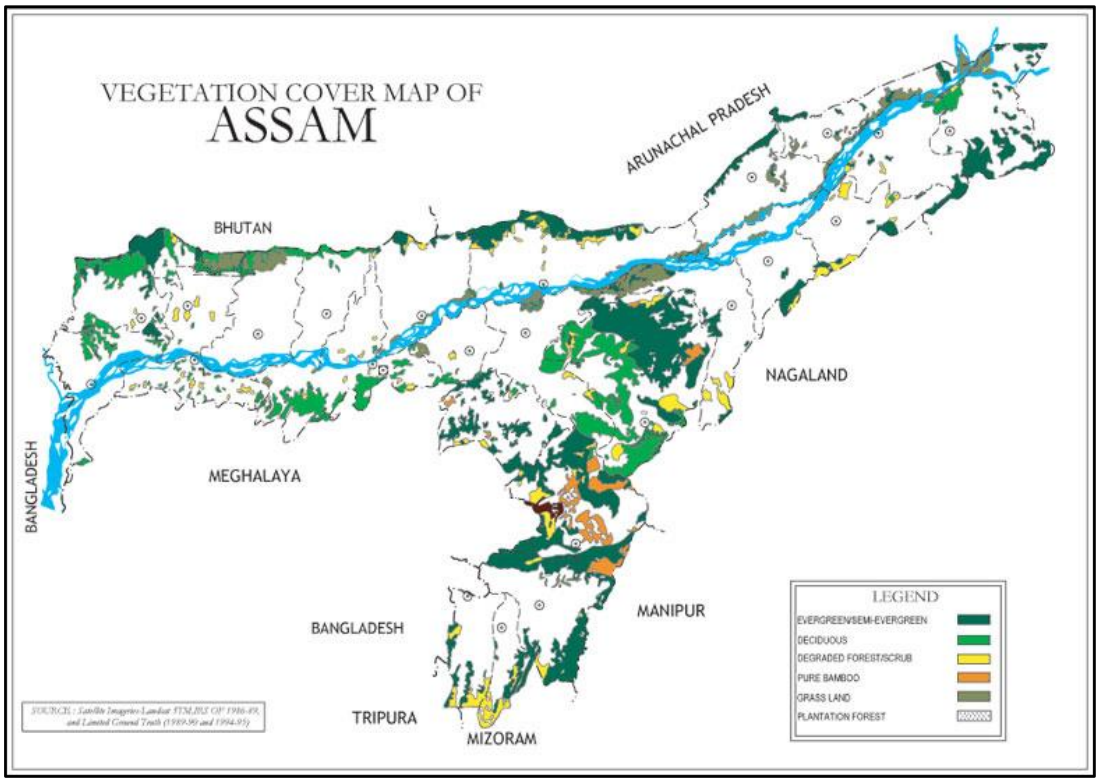
The climate of the region of Mikir hills (Karbi -Anglong) and North Cachar hills (Dima Hasao) differs from that of the Brahmaputra Valley to some extent, mainly due to its high relief. It is uncomfortable except in winter and becomes oppressive during

monsoons. In the summer months, the region experiences high temperature and low rainfall due to its location in the rain shadow zone. The climate of this region is somewhat different from that of the Meghalayan plateau, too, though the region is interconnected by hills (Singh, 2016).

2.6 Vegetation

The vegetation of Assam region is predominantly tropical, moist and deciduous in nature with some isolated patches of Montane subtropical and temperate which may be due to the impact of heavy monsoonal rainfall (Singh, 2016). The natural vegetation in the state of Assam falls in the classes of evergreen and semi-evergreen forests, which requires alluvial soil capable of retaining higher amount of moisture. Many of the species are used as timber wood and as construction materials.

a) Tropical evergreen forests: These are found in the sub-regions of Sibsagar and Lakhimpur as well as in the sub-Himalayan tracts in the north-western part of the state. In the Cachar sub-region these are found to be located along the northern and eastern parts of the lower slopes of the hills as also in the lower *tillas* (hillocks) and along the narrow banks of the rivers.
b) Mixed deciduous forests: This type of forests is found in the lower part of Brahmaputra Valley and act as a belt between the highland Savannah forests and the Sal forests.
c) Riverine forests: The areas bordering Bhutan, Goalpara and Kamrup sub regions to the eastern parts of Darrang are largely dominated by this kind of vegetations. This is confined to alluvial flats along large streams (Gopalakrishnan, 2000).



Map 2.6: Map showing the vegetation cover of Assam (Source: Assam Remote Sensing Application Centre)

2.7 Crops

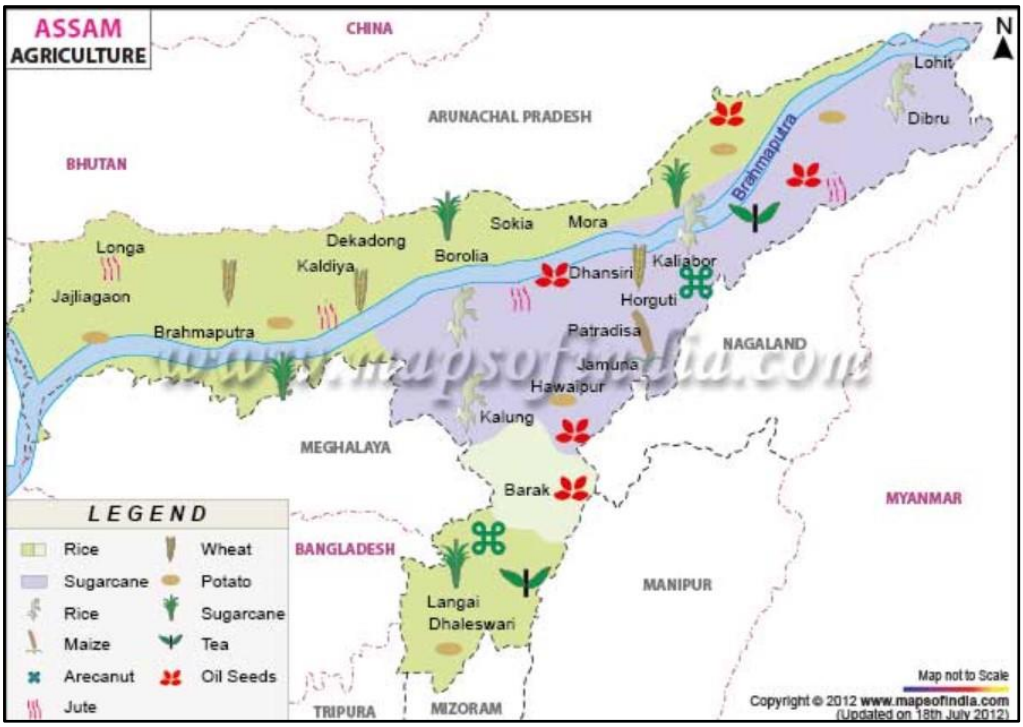
In Assam the soil, topography, rainfall and climate in general are very conducive for agricultural activity, mainly for the cultivation of paddy. Agriculture is the main occupation and primary resource base of Assam region. The Kamrup District of lower Brahmaputra valley has the highest net sown area and lowest is Lakhimpur on the upper Brahmaputra valley. About 22% of the land is not available for cultivation due to physical reason like river beds and 10% of land is covered with thick bamboo vegetation and other trees (Singh 2016). Total land under cultivation was 2.83 million hectares in 2014-15 which almost 36 percent of total geographical land area of the state (Economic Survey of Assam report, 2017-18). Of the total crop area, the food crops occupy a large portion followed by cash crops e.g, tea, jute, tobacco, sugarcane and oil seeds and then minor crops like vegetables, potatoes, fruits, cotton etc which is very low.

Rice is the principal crop followed by tea which is grown in highest quantity towards the upper and central course of Brahmaputra valley. By the last quarter of 19th century, tea became the chief export item of the country as a whole. Concentration of jute stands

in third in lower Assam valley. Oilseeds are grown in highest in the districts of Goalpara, Kamrup, Darrang and Nagaon. Pulses are grown mainly in lower Brahmaputra valley area whereas sugarcane are distributed mostly in the districts of Sibsagar and Kamrup. Tobacco cultivation is mainly concentrated in the lower Assam valley (Singh, 2016). The foothill region of Assam alongside the borders of Goalpara practised wet method of paddy cultivation

The Mikir hill population is mainly dependent on rice which is their staple food and principal crop that is growing widely through the practice of Jhuming. The people of North cachar, Nagaland and Mizo hills are practically dependent on agriculture and jhuming is their usual practice. The techniques of conventional methods like ploughing and manuring is the basic and hoe is the primary device. Paddy, millets and maize are the dominant crops. At places of Manipur, terraced cultivation has been developed along with the older method of Jhuming.

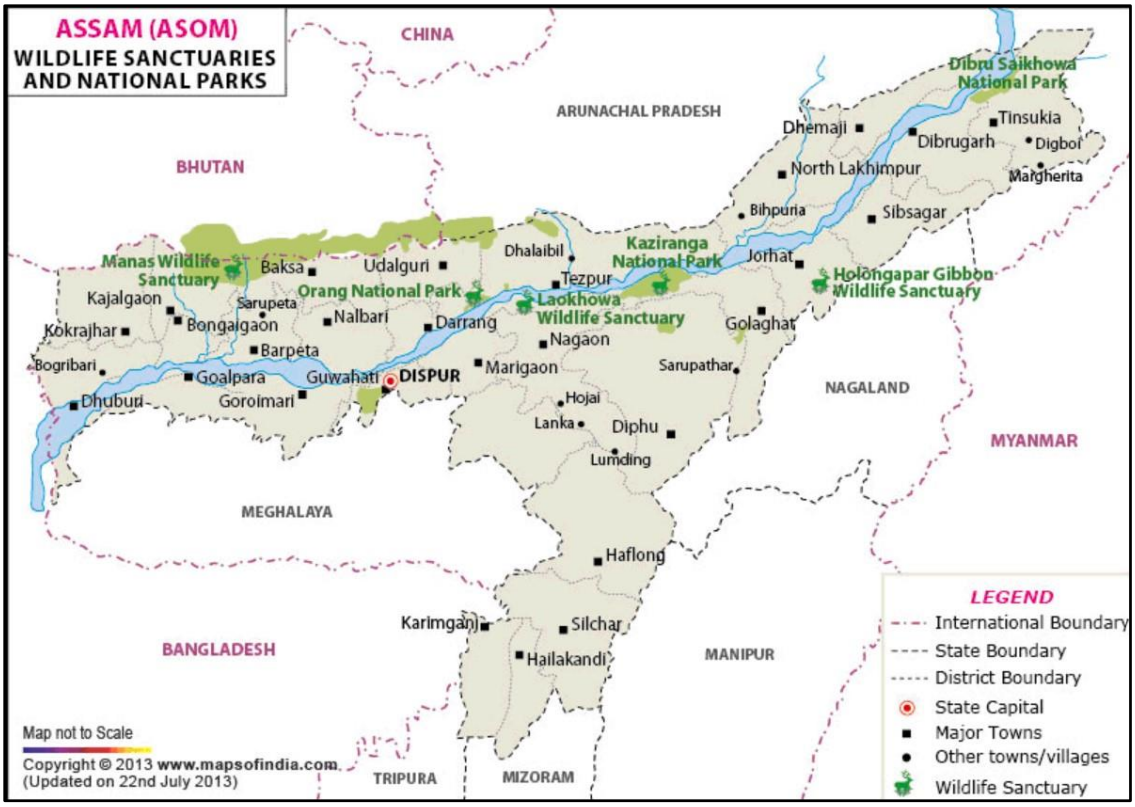
The crop pattern varies from higher jhum land to lower plain strips. The principal Kharif crops are those which are dominated by rice, jute and tea and are dependent on weather and topography. The rabi crops are harvested in early summer (February and March) which includes gram, pulses, mustard, tobacco, potato, sesame, and vegetables (Gopalakrishnan, 2000).



Map 2.7: Map showing the agricultural pattern of Assam (Source: Maps of India)

2.8 Fauna

Wild life has an immense importance in the forests of the region. The fauna of Assam is somewhat peculiar, in that it contains animals not to be found anywhere else in India. Two important wildlife sanctuaries of national importance are Kaziranga National Park (World Heritage Park, International status) and Manas National Park. The region is more known outside the state and the country as the home of rare one horned Rhinoceros (*Rhinoceros unicorns*), one of the five types of rhinos existing in the world. In size this is next to the two horned African white Rhino, the biggest. Manas wild life sanctuary is popular for wild buffalo. Despite Rhinos and Buffalos, the region is the natural habitat for other mammals, birds and ducks, swamp deer, wild boar, wild elephant, tiger, leopard etc.



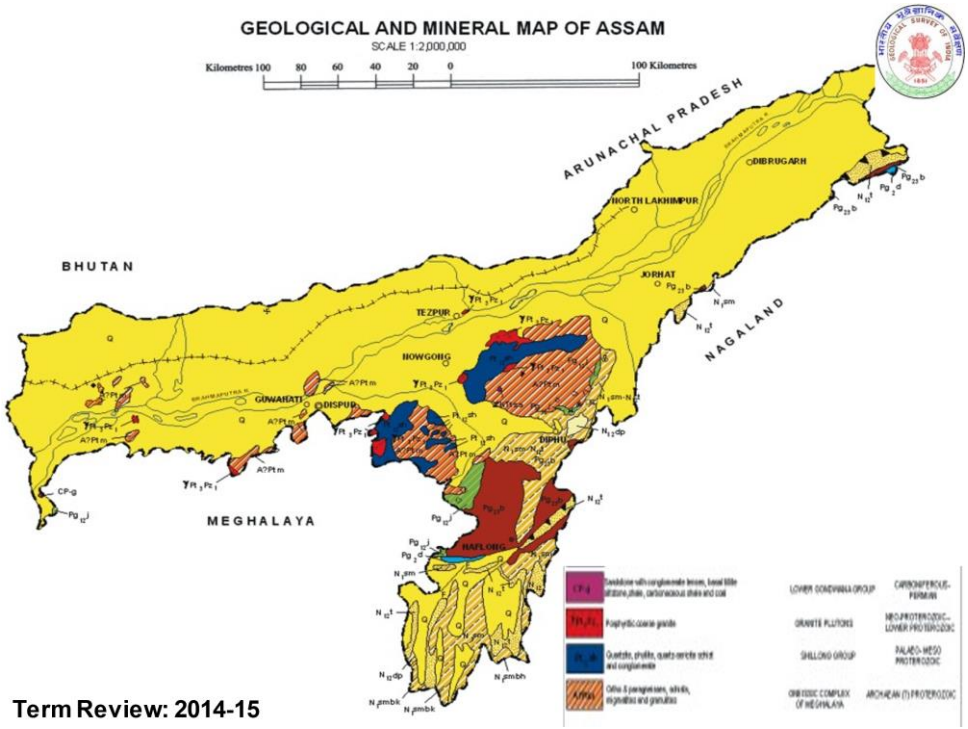
Map 2.8: Map showing richness of Fauna in Assam (Source: Maps of India)

2.9 Mineral resources

The region is rich in oil and coal. The upper reaches of Brahmaputra valley have a large reserve of oil which is nearly 50 percent of the country's total oil reserves. The oil fields of Digboi and Naharkatiya are geologically confined to the Tertiary strata on the top of Oligocene. Digboi is surrounded by a semi-circle of high mountains of the Naga thrust.

The oil fields in the valley are under cover of a thick mantle of alluvium which conceals the oil-bearing rocks. The oil is found at depths ranging from 270 m to 4300 m., in addition to this, a large number of new oil wells are associated with natural gas, while some produce only gas (Singh, 2016)

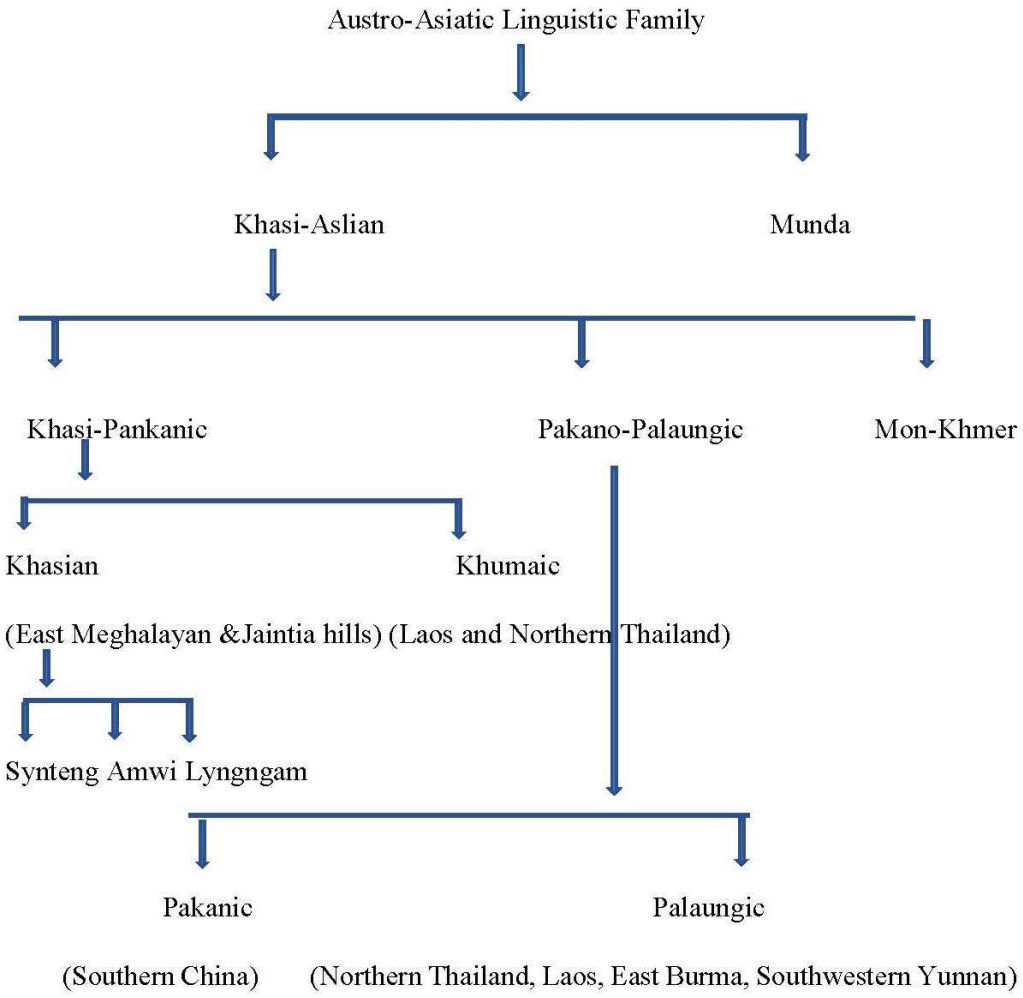
The coal fields which are of Tertiary origin are concentrated in the South-eastern part of the valley. The major Coal fields are Ledo-Makum, Jaipur-dilli and Nazira. The coal of the region has remarkably low ash but high sulphur. Apart from their general uses for railways, iron and bruss foundries, brick kilns etc, they are suitable for manufacture of coal distillation products (Singh, 2016). Deposits of limestone are noted in the hills of North cachar and the other hilly areas of Nagaland, Manipur and Tripura. On the other hand, the Meghalaya Mikir region is rich in mineral resources like coal, limestone and sillimanite. The important minerals are: Upper Cretaceous and Lower Tertiary coal in Garo, Khasi and Mikir hills; the high grade nummulitic limestone; Sillimanite and corundum deposits ; Clays including Kaolin or 'China clay' in Garo (Tura hills); Khasi (Mawphlong area) and Jaintia and Mikir hills; glass sands; banded iron ore in the border areas of the Khasi-Jaintia hills and Assam valley; copper in Khasi Jaintia hills; gold bearing rock in Khasi hills and Sebenite crystals in Garo and some parts of Mikir hills (Singh, 2016).



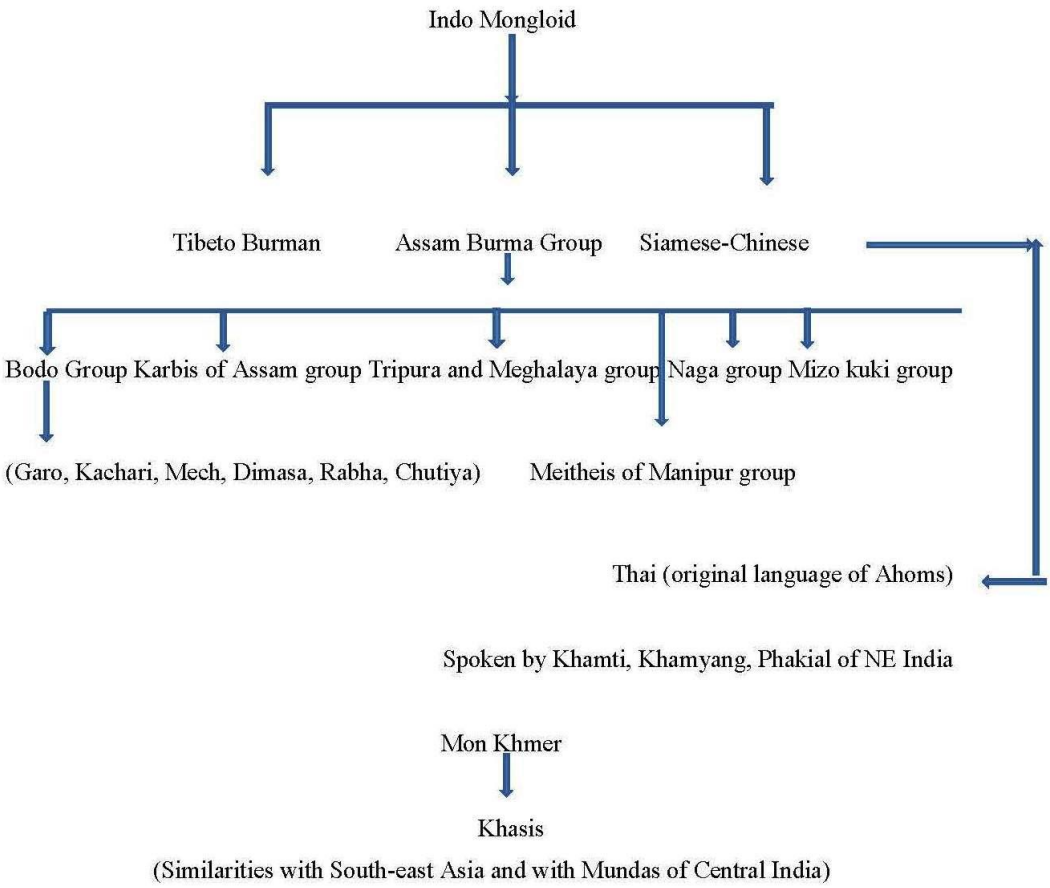
Map 2.9: Geological and Mineral map of Assam (Source: Geological Survey of India)

2.10 Ethnicity

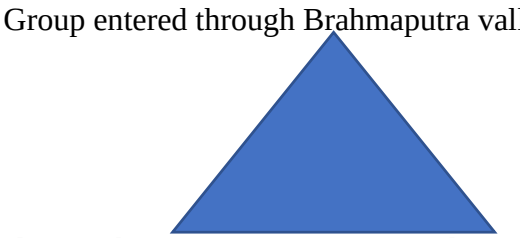
Assam serves the corridor for the migration of different branches of linguistic groups from time immemorial. During the historical period, the visiting of Hiuen-Tsang who wrote in his memorandum about the Mongoloid character of the people and clearly noted that 'the men are small in stature and their complexion a dark-yellow and their language differs a little from that of Mid-India' (Chatterji, 1955). In historical period the Tai of South China migrated to Brahmaputra valley towards the starting of 13th c CE due to the environment suitable for Wet cultivation of crops (Personal discussion with Sangita Gogoi), which was already a method of cultivation among the aboriginal inhabitants of Assam region. Mills (1928) refers Northeast India as one of the great migration routes of mankind. The monolithic stone jars have been related with the salt road connecting mainland India with Southeast Asia through North Cachar hills which had been used by different Southeast Asian population to collect salts from Indian region (Colani, 1935). She remarked that the Mon-Khmer population who she relates with the maker of stone jars, must have entered the area during first millenium BCE. The DNA evidence collected from a small group of Khasi population from North Cachar confirms its association with the Mon-khmer group (Thakuria et.al. 2016). Khmer, Khasi, Munda, Vietnamese are the Austro-asiatic language, widespread in Southeast Asia. The diagram as detailed by Driem (2012) for the distribution of Austro-asiatic language in parts of Northeast India and Southeast east Asia too some extent confirms the theory of migration in distant past.



According to Das (Das, 2008; Pp. 3) "All the tribes of NE India are basically Mongoloid or Indo-mongoloid who speaks two different languages; Tibeto-Burman (spoke by most of the Ethnic community of Arunachal Pradesh) and Siamese-Chinese. Moreover, there is another group, Mon-Khmer, who speak Austro Asiatic language". His description of different linguistic family is shown through the below chart which is easier to understand.



Das (2008) also describes the migration route of Tibeto-Burman population through three different possible routes and said that they diversified from somewhere in North Burma into three groups.



According to Edward Tuite Dalton there is doubtless and intimate connection between the Indo-Chinese population of Assam, and some of the people that formed nations in the Gangetic provinces before the aryans appeared in them. We can trace the path of many hoards from the North-eastern frontier to remote regions of India and Burma; and we find in Assam colonies formed as it were of the strugglers of the parties that had

passed through (Campbell, 1866). According to Chaudhury (1985), the Brahmaputra valley served as an easternmost out-post of Indian civilization along with maintaining relations with Burma, Bhutan, Nepal, Tibet etc and this statement also supported the route theory suggested by Das. Gait (2008) suggested that Prehistoric period of Assam started with the coming of Mongoloid people and their amalgamation with the local inhabitants or tribes. Genetic studies on the population migration in the North-east India on Y-Chromosomes by Kumar et.al (2007) reveal a common paternal heritage of Austro-Asiatic populations. Certain Tibeto-Burman and other Sino-Tibetan speaking tribes (Mongoloids) have formed parts of the settled population of Assam since time immemorial. Bodos established their territory fairly early whereas Abors, Akas, Daflas, Miris, Mishmis came later and occupied mountainous region of Brahmaputra. Later some Austric and possibly Dravidian tribes preceded Bodos and with the Aryan speaking elements from Bengal and Bihar along with the Siamese-Chinese section or Thai Ahom's finally becoming Aryan Assamese speaking masses of the valley (Chatterji, 1955).

2.11 Zonal Division of Assam Region (present Assam) Based on various environmental parameters

There are seven states of Northeast India which are geologically inter-mingled. Present political boundary divided the region into Assam, Arunachal Pradesh, Nagaland, Mizoram, Manipur, Meghalaya and Tripura. R.L Singh in his "India: A Regional Geography" (2016) divided the entire North-east region into: i. Assam Valley (Mainly Brahmaputra and Barak Valley); ii. Meghalaya and Mikir Region; iii. Eastern Himalayas or Assam Himalayas (the areas of Arunachal Pradesh and bordering areas of Assam with Arunachal) and iv. Purvanchal (Nagaland, Manipur, Mizo hills, North cachar and Tripura) in broad category on the basis of physiography and other environmental conditions.

In a broader way, the entire Assam region (present political state of Assam) can be divided into three divisions with a number of sub-divisions as various environmental zones. It can be assumed that the environmental suitability of any region influences the development and character of cultures, whereas political boundaries are primarily artificial constructs to suit the administration. The first three zones are: Brahmaputra valley; Barak valley and Hill districts which are again sub-divided on the basis of upper

and lower course, left and right bank of the river along with foothill regions. The hill district is again sub-divided into Mikir region and Barail range. Archaeological investigation in Brahmaputra valley revealed many facts regarding the uses of the area. Most of Early Historical sites followed by Medieval and late Medieval sites are found in this valley though no Prehistoric site has been reported till date. But some areas which are surrounded from one of two sides by the hills seem to have Prehistorical affinity.

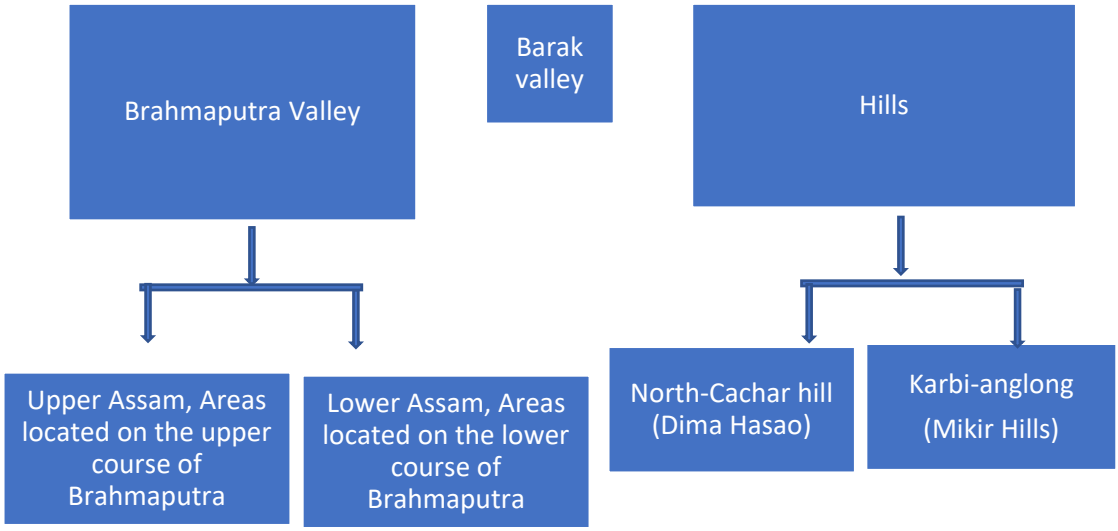


Table 2.1: Environmental macro zones of Assam with past cultural evidences

Macro Zone	Parameters used for zonal divisions	Cultural material	Period
Brahmaputra Valley	Area drained by River Brahmaputra from its upper course to lower, geological formation	Pottery of different cultural periods, inscription, sculptures, monuments (religious and secular structures, rock-cut caves), monumental columns and graveyards	From Early historic period to colonial period, a continuous occupation of various phases of history in different parts of the valley
Barak Valley	Area drained by Barak River basin	Monuments of architectural importance	Medieval
Hill	The hill districts or Assam. North cachar hills (pre-Cambrian formation) and Mikir hills (an extension of Meghalayan plateau)	Stone tools, Pottery, Megaliths and Monoliths, Structures made of stone and bricks, colonial structures	Neolithic to Colonial period

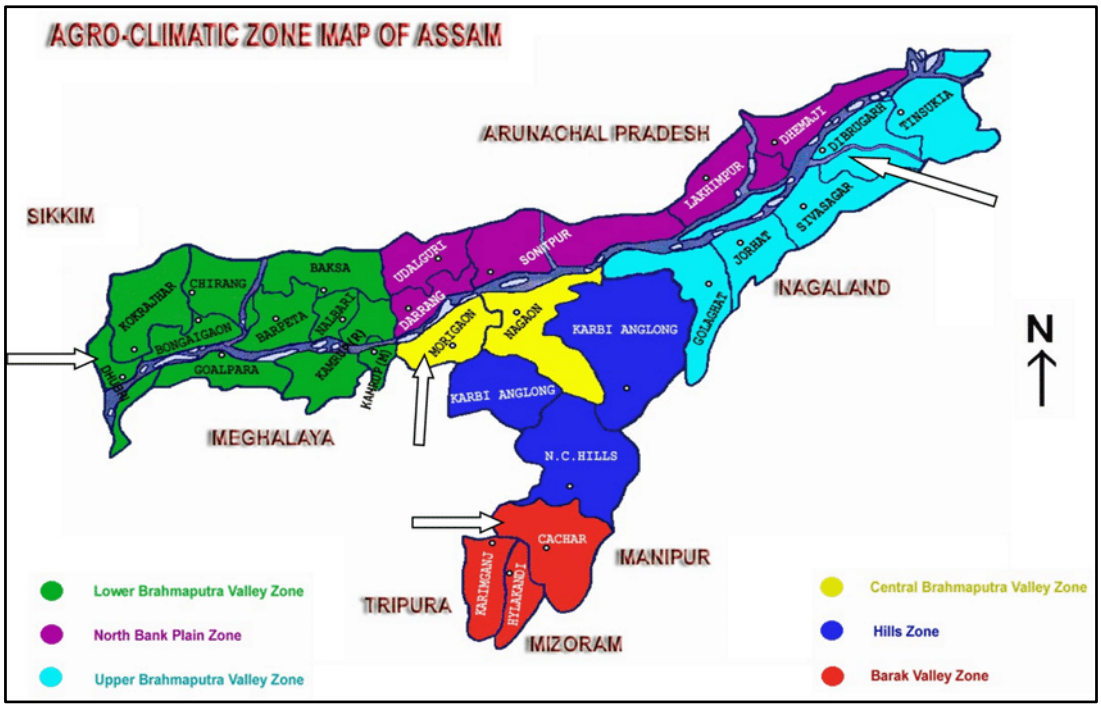
Brahmaputra valley: The valley is the eastern continuity of the Indo-Gangetic trough of North India, covers almost 72% of Assam. The vast alluvial plains of Brahmaputra valley occupy most of the North Assam covering Goalpara, Kokrajhar, Dhubri, Kamrup, Nalbari, Barpeta, Nagaon, Darrang, Sonitpur, Sibsagar, Jorhat, Golaghat, Lakhimpur and Dibrugarh districts. The Brahmaputra valley is bounded by Arunachal Himalaya in the north and northeast, Patkai – Naga – Lushai range of Nagaland and the Shillong Plateau in the south and southeast. The valley is mainly a Quaternary fill valley with a few sedimentary residual hills in Upper Assam and inselbergs and hills of gneissic rocks in the Darrang, Kamrup and Goalpara districts. The drainage pattern in the valley apparently seems to be of antecedent type.

Archaeological investigations in Brahmaputra valley have revealed many aspects about land-use patterns in the area (Reference). Most of Early Historical sites followed by Medieval and late Medieval are found in this valley. Though no Prehistoric sites has been reported from the plain riverine area of Brahmaputra River till date, but the foothill

region, close to Meghalayan plateau, few kilometers away from the former, have provided the evidence of Prehistoric cultural affinity. Here we can infer thatthe riverine areas were either occupied lately or sites were washed away by the tidal force of the river, close toit.

Barak Valley or Cachar plain: This covers 9% of the total area. The hilly and alluvial terrain in the south covers the Cachar and Karimganj districts in the Barak (Surma) valley.

Hill Region: This cover about 19% of the total area. The Central Assam which essentially is a hilly terrain comprised of Mikir Hill in Karbi Anglong and North Cachar Hill districts. Mikir hill is a tableland which is eastward extension of the massive block of the Indian Peninsular shield from which it has been separated by the Malda gap. It is an extension to the Meghalayan plateau and even the entire region is called as Meghalayan Mikir Region. Mikir hills are partly surrounded by plains on three sides. The entire area has been drained by the rivers opened from the hill ranges of Meghalaya. The climate is differed from the Brahmaputra valley due to its high relief. The Rainfall pattern of the Mikir region is considerably low due to its location in the rain-shadowed zone.



Map 2.10: Map showing the Agro-Climatic zones of Assam (Gopalakrishnan, 2000)

Gopalakrishnan (2000) sub-divided the region into six Agro-climatic zones on the basis of terrain, rainfall and soil characteristics:

- The North bank plains
- The upper Brahmaputra valley
- The central Brahmaputra valley
- The lower Brahmaputra valley
- The Barak valley
- The hills

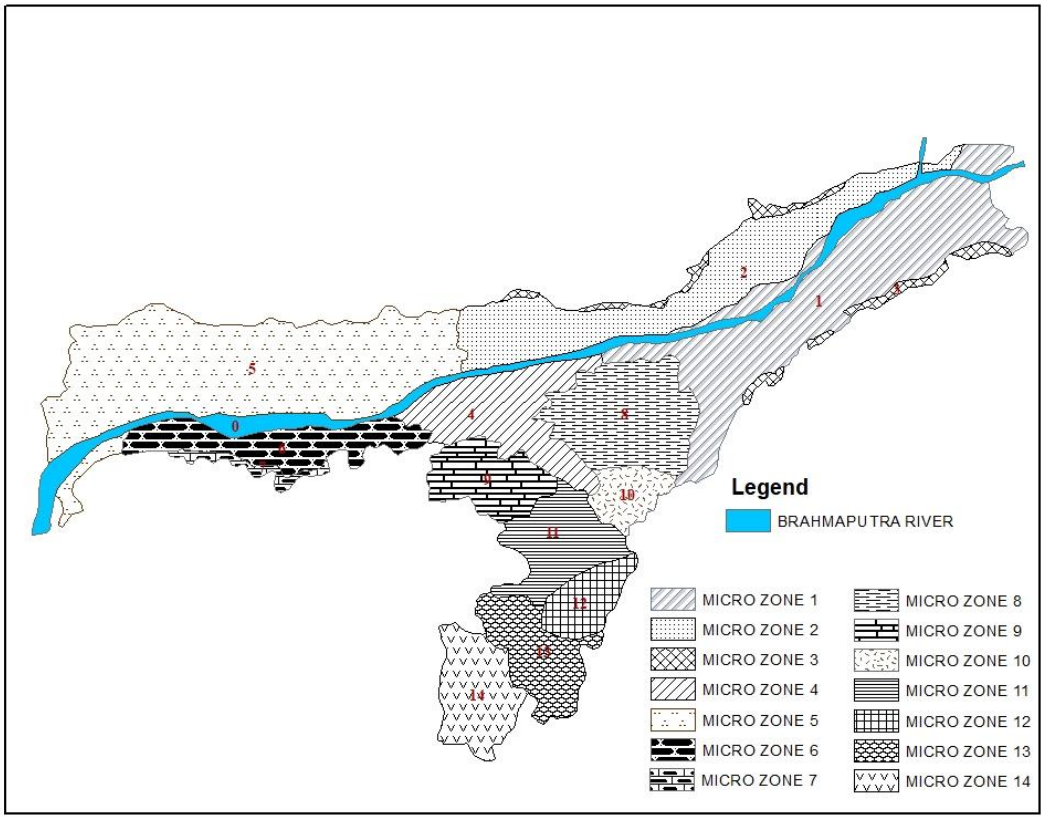
According to the nature and distribution of rainfall, there are three distinct zones of Assam (Gopalakrishnan, 2000). They are:

- Zone of heavy rainfall which covers the districts of Dibrugarh, Lakhimpur, Sibsagar (Upper course of Brahmaputra); Dhubri, Goalpara, Kokrajhar (Lower course of Brahmaputra) and Cachar, Karimganj (Barak valley).
- Zone of medium rainfall that covers the districts of Kamrup, Darrang (Lower Brahmaputra valley); Sonitpur and Golaghat (Upper Brahmaputra valley); Nagaon (Central Brahmaputra valley) and Karbi-anglong.
- Low rainfall or the area shadowed rainfall comprising adjoining Meghalayan plateau and southern Nagaon district.

2.11.1: Micro Zones of Assam

The Micro zones are twisted on the basis of various micro distinguish environmental factors though in many cases the areas have similarities. Furthermore, there are numerous variations within a single micro zone that are currently difficult to distinguish simply by looking at macro scale physical settings. For instance, in the context of micro zone 1, the rainfall pattern of Dibrugarh is higher than the rest, but the other contexts are almost similar. The parameters chosen for zonal division includes climate (precipitation and temperature), fauna, flora, geology, geography, wind and exposure, spatial and temporal variability, and seasonality. After dividing the region into zones, the cultural developments throughout the ages are amalgamated with the contexts of each zone, which has been followed in exploring the research region, and priorities are given to the areas with earliest cultural discoveries. Some zones are seemingly shadowed area in contexts of earliest cultural material, which may have due to non-

exploring the area properly or due to various natural causes, the materials do not leave a mark or might culturally unexploited area in the past. Hence, the cultural development indicates all the explorations and excavations carried out by various state and central government organisations as well as by the Universities. The micro zones are described in details in the following of this chapter and a table is created to combine the zones and the cultural materials periodically.



Map 2.11: Micro zones of Assam

Micro zone 1: Left bank of river: (Tinsukia, Dibrugarh, Sibsagar, Jorhat, Golaghat) This area receives more than 3000 mm of rain per year. The tributaries are much larger than the north bank and flood plain. The formation of river terraces is conspicuously absent. According to geomorphology, it is a flat alluvial plain of the Brahmaputra and its tributaries composed of quaternary older and new alluvial deposits. Tea cultivation is extensive. In terms of oil and minerals, the left bank of the river is more developed than the right bank. Among the areas of Zone 1, the Doyang-Dhansiri valley of Golaghat is little bit dry area in terms of annual rainfall.

Micro zone 2*:* Right bank of river: (Dhemaji, Lakhimpur, Sonitpur) It is a long swath of land located between the Brahmaputra and North-East Frontier Agency (NEFA), presently known as Arunachal Pradesh. The tributaries flowing down from the NEFA Himalayas emerge abruptly to form a series of alluvial tracts in the main valley. The tributaries have prominent meandering courses that result in the formation of lakes and oxbow lakes, as well as a vast marshy tract with wet soil and dense vegetation cover. It is a fertile soil region with adequate rainfall and high agricultural potential. Floods are caused by the shifting courses of streams and rivers (Singh, 2016).

Micro zone 3: Northern foothills zone of the lesser Himalaya: Geologically this zone is formed by tectonic formation of Siwalik group which belong to Pliocene-Pleistocene age. The lithology consists of micaceous sandstone. Agriculture is very prosperous here and the area is densely populated. This zone does not receive heavy rainfall as the rain gauge network is not prominent due to its connection with Himalayan region. The vegetation is mostly evergreen.

Micro zone 4: (central Brahmaputra valley): This zone covers the area of Nagaon, Morigaon and Tezpur district which represents the characters of both lower and upper course of Brahmaputra valley or could fall between the transitional nature between rice and tea culture. This zone receives lower rainfall than zone 1 and 2.

Micro zone 5**:** Right bank in lower course of Brahmaputra: (Darrang, Nalbari, Kamrup Barpeta, Bongaigaon, Kokrajhar): This zone falls within the lower Brahmaputra, is swampy and contains numerous *bhils* and water-logged areas. Geologically it belongs to younger alluvium formation. It is rich in rice and jute cultivation. Also known as *charland*, this zone is characterised by a number of transverse streams that has greater contact with the great plains of India. Less rainfall than the areas located in upper course of Brahmaputra.

Micro zone 6: Left bank in lower course of Brahmaputra: parts of Morigaon, Goalpara, Dhuburi and parts of Kamrup district. Geologically the entire area belongs to Archaean formation, intruded by massive porphyritic and coarse biotite granites, pegmatites, quartz veins etc. isolated monadnocks interspersed with erosional plains. Cultivation of jute, sugarcane and rice is rich here. Rainfall is medium.

***Micro zone 7*:** Adjacent to hilly region or the foothills of Meghalaya; parts of Kamrup and Goalpara districts. This region is predominantly formed of the Precambrian rocks of the gneissic complex. Climate of the foothills is same like Brahmaputra valley with little variation due to the uneven topography with a number of hills and low-lying areas. The annual rainfall in this area is between 200-250 cm.

***Micro zone 8*: (**Northern and eastern part of Mikir Hills): Geologically this zone falls into the Archaean formations comprising of metamorphic complexes of gneiss and schist intruded by younger acidic or basic intrusive. The northern ranges are an extension of Dabaka or Nagaon region which is a plain area with an average elevation of about 600 m. Main River system is Dhansiri and Kopili Jamuna (in lower course it is known as Jumna) which flows towards the plains of Nagaon district and joins Brahmaputra. The Jamuna valley is densely populated and broader whereas the Dhansiri valley is much narrower which rises in Naga hills (Dutta, 1979). Rainfall is low as this area is rain-shadowed and the monsoonal weather could not reach the area from either side. Soil concentration is old alluvium in nature which are good for cultivation of rice, fruits, vegetables and tea. The region is covered with dense forest and thick jungle. Both wet rice cultivation and step cultivation is practised here in the plain river valleys. Various old tanks and lakes are used in the area adjacent to Nagaon for agricultural and fishing purpose (Singh, 2016).

Micro zone 9: (Western part of Karbi anglong): Geology of this zone consists of pre-Cambrian formations (Shillong group) consisting Quartzite and Phyllite, which is again considered as easterly extension of the Shillong plateau or called as Meghalaya-Mikir region. The average elevation is 1000 m. Main River is Kopili and Karbi langpi or Barapani of which Karbi Langpi has been originated from Jaintia hills and enters Karbi angling just below its confluence with the Umlew. In its upper reaches it is known as Umkhen and as the source of the river lies in a region of heavy precipitation, it brings down a large discharge and while passing through the low-lying areas it spills copiously right from the foothills (Dutta, 1979). When it floods, it also holds up the Kopili flood on the upstream and greatly flooded the Baithalangshu area. The rainfall in this part is higher due to its strategically connected area with Jaintia hills. The soil type of this particular zone is Laterite which is highly leached, poor in plant nutrients and acidic in reaction. The region has less forest than the eastern division. Jhuming is the main

method of cultivation which dominates the agricultural landscape. The region has been inhabited by mostly Karbis along with Khasi and Jaintia (Singh, 2016).

Micro zone 10: (Southern margin of Karbi-plateau): Geologically it belonged to Upper Tertiary formation (Oligocene-Miocene-Pliocene) with shelf and the geosynclines sediments, known as the Rengma hills. This area has an average elevation of about 900 meters AMSL. A series of streams drain the area, eventually joining the Kopili River. The zone is dominated by red loam or hill soil, which varies between clayey and sandy loam and is generally suitable for cultivation. The region has a dense forest cover, similar to the central Brahmaputra valley. Jhum is the most commonly used cultivation method among the population. The zone receives lower rainfall than the western zone of Mikir hill in Karbi-anglong District (Singh, 2016).

***Micro zone 11*:** The north-western part of the North-Cachar Hills District which is structurally an extension of the Mikir Hills to the north-west comprising Archaean rocks, has been included under the material division of the Meghalaya plateau.

***Micro zone 12*:** Pre-Cambrian formations (Shillong group) or the Barail range consisting of Quartzite and Phyllite considered as easterly extension of the Shillong plateau in northern parts of the North Cachar hills. The Barail range has with its steep southern face, falling into the Cachar plains with full of gorges and swift flowing rivers.

Micro zone 13: Hills of Cachar: Area is covered by Upper Tertiary (Oligocene-Miocene-Pliocene) shelf and the geosynclinals sediments. The isolated hills that dot the plain break the monotony and locally called as *Tillas* (Gopalakrishnan, 2000).

Micro zone 14: Cachar plains, like the Brahmaputra plain, are alluvium tracts (both older and younger) or Quaternary deposits. This plain is surrounded by hills on three sides, and it is open on the west side, where it merges with the plains of Bangladesh. The area is also distinguished by a series of projections of low hills, which are referred to as a separate zone due to the different geological formations (zone 14). These low hills cause a number of depressions known as Bils and Hoars to form. The annual rainfall exceeds 2000 mm in the area, with temperatures ranging from 37° C to 9° C. The soil is fertile, but it is prone to becoming acidic. The vegetation of the area is

tropical moist to dry deciduous vegetation with crop system is mainly dominated by rice and jute (Gopalakrishnan, 2000).

After this division of areas on the basis of its physiography and environment, distinguish cultural pattern is noticed. All the zones have different cultural identity which starts from prehistoric to historic period though either one or the other cultural development took place. It is shown in the table below:

Table 2.2: Environmental micro zones of Assam with their cultural Materials so far explored

Micro Zone	Cultural material	Period	Reference
Zone 1	Inscription belonged to 4th century CE, architectural and iconographic evidence of late early historic period, Ahom period architecture and monument	4th century CE-18th century CE	Barpujari, 200 Kouli, (2017-18) Sarma, 1988. Directorate of Archaeology, (archaeology.assam.gov.in)
Zone 2	Ahom period architectural remains; temple ruins of dateable to c 800-900 CE; Brick fragments depicting natural (birds, floral, human, animal figures) depictions, colonial period war memorial column and graveyards	Early medieval to colonial period	Sarma, 1988 Directorate of Archaeology, (archaeology.assam.gov.in)
Zone 3	Cultural material includes remains of Temple plinth, at Malini Than and archaeological remains at Sadiya	Belonged to 10th-11th century CE, Chutiya period ruins (-Some recognized	Sarma, 1988 Baruah and Nath, 2007

		them as Pala ruling dynasty)	
Zone 4	Cultural material includes Gupta period temple remains at Dah-parbatiya, Ruins of Bamuni hills and from Nagaon we have evidence of 8^{th}-9^{th} century temple architecture (Na-nath) and various inscriptions.	6^{th} century CE (earliest) based on iconographic evidence.	Harpujari, 2007 Sarma, 1988 Directorate of Archaeology, (archaeology.assam.gov.in)
Zone 5	Pala period temple ruins (Madan-Kamdev) and inscription; Ahom period temple remains, inscriptions, brick structures, brick temples of Koch dynasty	Medieval period	Directorate of Archaeology, (archaeology.assam.gov.in), Barpujari, 2007; Sarma, 1988;
Zone 6	Early historic settlement at Ambari with stone sculptures, terracotta objects, ceramics made of Kaolin clay, ornaments, Terracotta clay sealings, gold coins of 7^{th} c CE, rock cut-caves, secular structures, dolmens of Tiwa community and monoliths of Karbis, rock inscriptions, temple structure of Ahom	2^{nd} c BCE to Colonial period via a good number of remains during early medieval to medieval period. A continuous occupation	Directorate of Archaeology, (archaeology.assam.gov.in), IAR (1968-69, 1987-88, 1988-89, 1989-90, 1992-93, 1997-98, 1999-2000, 2008-09)

	and Koch dynasty, colonial period structure and graveyard.		
Zone 7	Stone tools, cord-marked pottery, Megaliths (Menhirs and Cairn circle)	Neolithic period (earliest date from Bambooti, Goalpara district)	IAR (2012-13)
Zone 8	Temple structure, rock inscriptions, medieval tanks, ramparts	11^{th} c CE (stylistically dated)	Directorate of Archaeology, (archaeology.assam.gov.in),
Zone 9	Rich in Megalithic remains (dolmens and menhirs), stone tools, sculptural remains	Neolithic stone implements (typologically)	Bezbaruah, 2003
Zone 10	Rock cut sculptures	-	Directorate of Archaeology, (archaeology.assam.gov.in),
Zone 11	Monolithic stone jars, Neolithic stone tools		Mills and Hutton, 1932 Thakuria et.al, 2016
Zone 12	Neolithic stone tools, cord-impressed pottery, Maibong stone house of Dimasa kingdom, colonial period monument	Neolithic (2.7 ± 0.3 ka (700 BCE) to colonial period	IAR (1962-63) Sharma et al. (2017)
Zone 13	-	-	
Zone 14	Brick build structures, inscriptions of the time of Dimasa king, Kachari ruins	Medieval period	Directorate of Archaeology, (archaeology.assam.gov.in),

Environment has a very diverse role on the changing of behavioral and cultural pattern of an area. The selection of habitats by both animal-plants and humans basically depends on the nature of the environment. Braidwood remarked that there was major cultural change in areas where environmental change was minor or absent (Binford and

Binford, 1968; Pp. 321). In the context of Assam, there is no evidence of cultural formation during the Pleistocene, and the earliest culture remains to Holocene or the recent geological epoch. The zones which geologically fall in Archaean and pre-Cambrian formations have the earliest evidence of habitation followed by the areas with older and newer alluvial formations. The zones with prehistoric cultural (Neolithic) affinity are located in rain-shadowed area but with deep vegetation cover. The rivers are gravely bedded, with their sources in Meghalayan hills, are mostly perennial. The zones with early historic to medieval cultural evidences are all found near the major tributaries of Brahmaputra or near Brahmaputra valley, which sought a culture tend to be more dependent on agricultural activity, as rivers and floods make soil more fertile. Furthermore, for a developed civilization, inter and intra trade relationship is required, which is also served by the river routes. Besides, all those areas fall in heavy rainfall zone.