CHAPTER II

PHYSICAL AND CULTURAL SETUP OF THE STUDY AREA

2.1. The Physical setup of the study area

2.1.1 Introduction:

The physical set up of any River basin plays a major role in research investigation. All the elements of physical set up like geology, geomorphology, climate, hydrology, sedimentology etc. determine the magnitude of gradational (degradation and aggradation) processes of fluvial environment. Although the Sankosh River basin is located in the region where tectonics activities are very high but the study area is situated in North Bengal plain. A detailed study of all the elements of physical set up give a better understanding of the geo-environment of the study area which has been analyzed in following headings. In this context it is included as Physical setup of our study area is concerned with natural properties of the earth's surface such as geology, geomorphology, relief, slope, drainage network, climate, drainage system, soil and natural vegetation.

2.1.2 Physical Background:

The Sankosh river basin is originated from the part of the Himalaya Mountain which is thought to be significantly unstable due to the collision of Angaraland in the north and Gondwanaland in the south (Gansser, 1983). The Himalayan and surrounding regions are a result of tectonic events and its topography, geologic structure, soil structure and texture influenced by it. In this context, it may be mentioned that along the strike, the Himalayan Orogeny may be classified into three major divisions. These are:

I. Western Himalaya (66° 00'E to 81° 00'E)
II. Central Himalaya (81° 00'E to 89° 00'E)
III. Eastern Himalaya (89° 00'E to 98° 00'E)

Gansser (1983) has identified five zones for the Himalaya Mountain from South to North. These main zones from south to North are (i) Sub-Himalaya with a belt of molasses like elastic deposit,

the Siwaliks, which border the Foreland basins. (ii) The Lower Himalaya with huge sedimentary sections of mostly late Pre-Cambrian age covered by Gondwana type rocks and by crystalline thrust sheets exposing a reversed metamorphism. (iii) The High Himalaya consisting of thick crystalline thrust sheets which form the base of the Tethyan sediments to the north, (iv) The Tibetan Himalaya or Tethys Himalaya with an independent tectonic on top of the crystalline sheets and involving a conformable stratigraphical column from late Pre-cambrian to Eocene; and lastly, (v) The Indus-Tsangpo zone, a major suture zone displaying orogeny sediments, ophiolites and ophioliticmelange formations with exotic block sand large ultramafic thrust sheets. Out of these five zones, only the sub-Himalayan belt is found in the Northern part of the study area whereas other zones are found in the upper course of Sankosh River which is located in Bhutan.

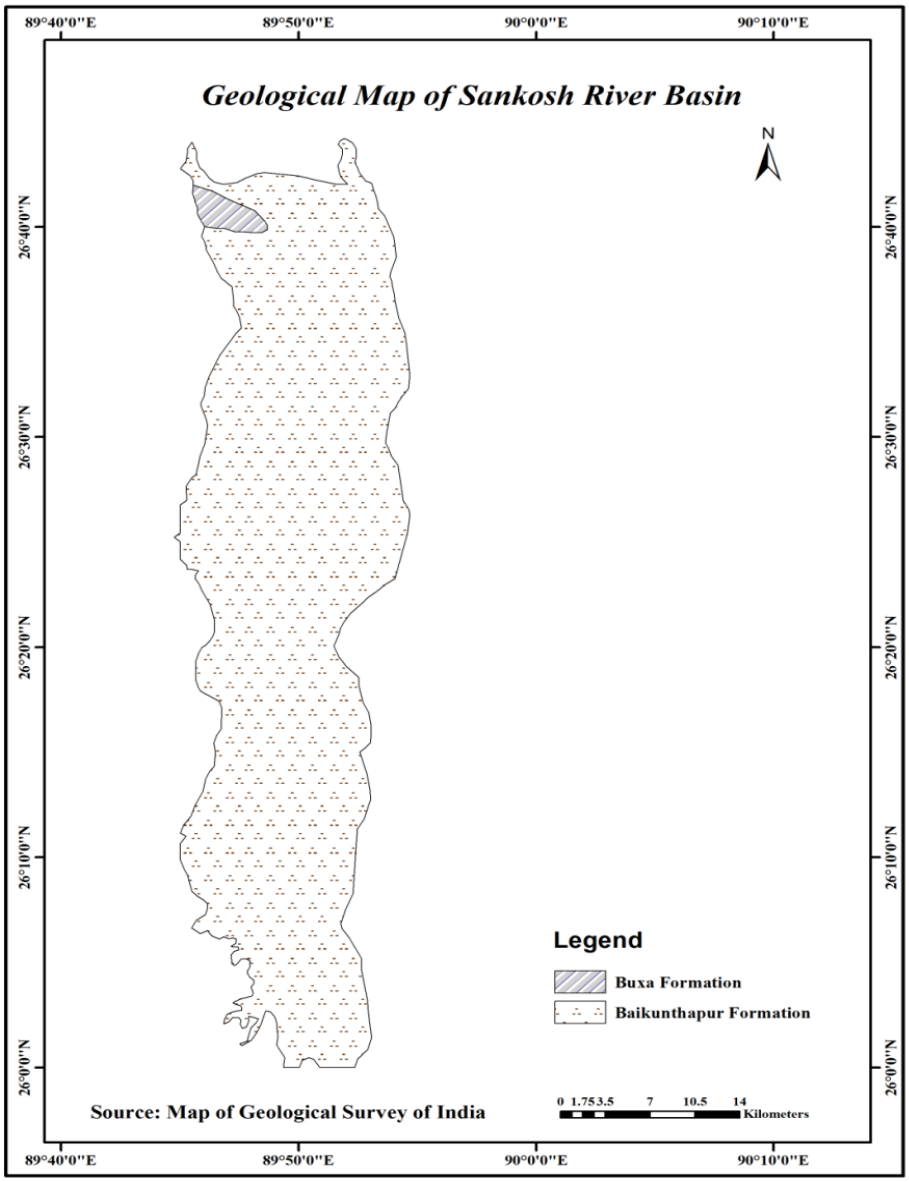
2.1.3 Geology:

Geological structure of an area is generally studied by the morpho and litho-stratigraphy. Thornbury (2004), in his Second fundamental concept has mentioned that "geologic structure is a dominant control factor in the evolution of landforms and is reflected in them." Accepting Davisian concept of landform development he emphasised on structure, process and time as controlling factor. According to the accounts of most of the geologists, the piedmont region of Northern part of West Bengal and western part of Assam, experienced subsidence and uplift due to thrust and faulting. Tectonic activities are frequent in this area along the faults to affects the pediment and flood plain deposits. On the basis of Geological map of Cooch Behar and Alipurduar District of West Bengal and Kokrajhar and Dhubri District of Assam, the study area is covered with different geological formations. (Map 2.1) In the upper part, only a small portion of the study area is covered by Buxa formation and whereas maximum part of the study area has been covered by Baikanthapur formation.

2.1.4 Geomorphology:

Geomorphologic history of study area has been featured by successive catastrophic events of accelerated deposition during the post-Pleistocene period. Uplift of the Himalayas during the Quaternary time led to the creation of faults parallel and transverse to the Himalayas and Sub-Himalayan tract. Geomorphologically, (Map 2.2) the study area has been classified into two

geomorphic units. (Bhuvan Geomorphological Map of West Bengal, 2005-2006). These are - i) Piedmont Zone and ii) Alluvial Zone.



Map 2.1: Geological Map of Sankosh River Basin

a) Piedmont zone:

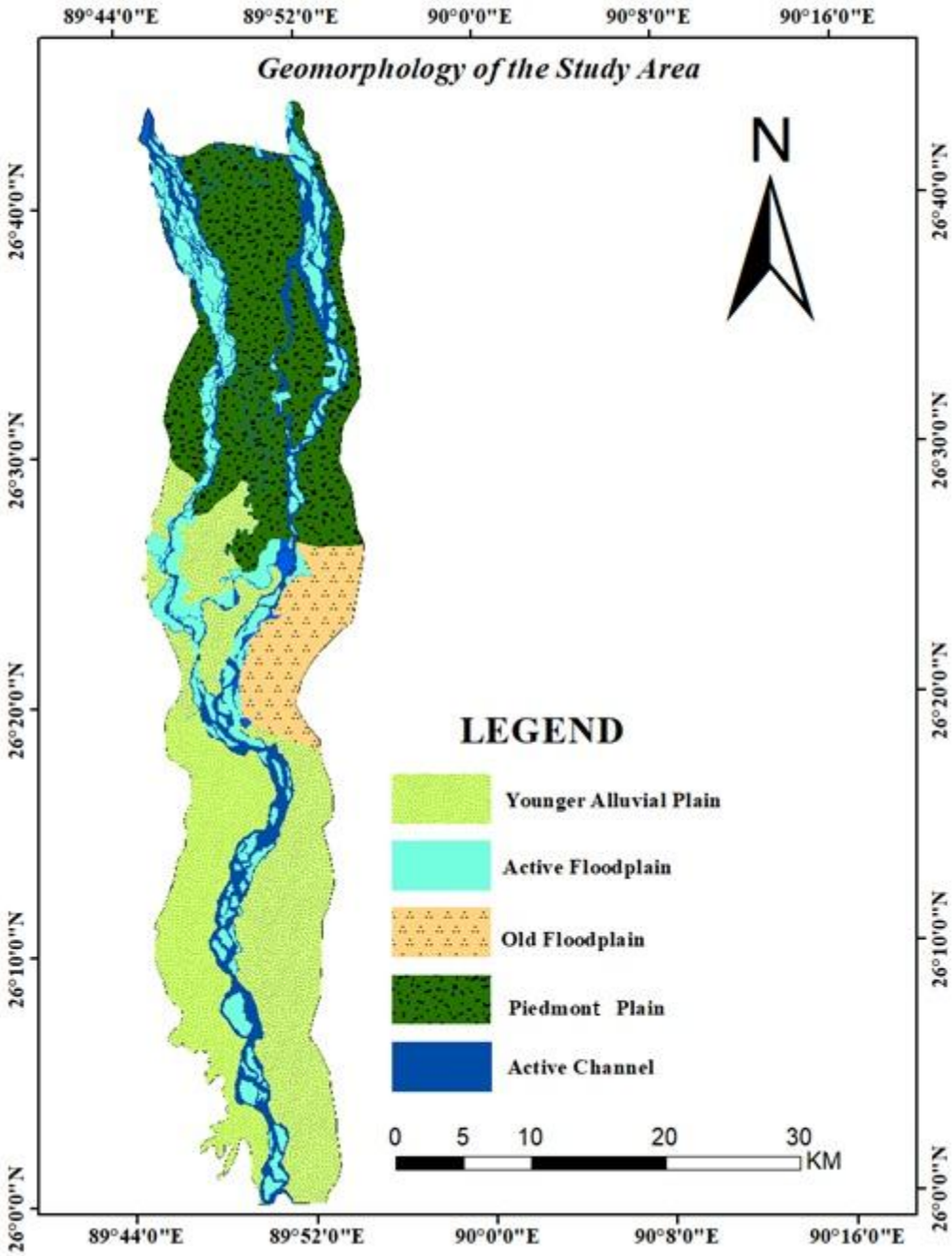
The piedmont zone is only found in the northern most part of the study area under the Sub-Himalayan foot hill zones. The average elevation of this zone is 250m from the mean sea level. This zone receives high rainfall throughout the year and covered by forests and tea plantation. This piedmont zone has arranged as a low-lying relief which is generally controlled by fluvial impact.

b) Alluvial zone:

The alluvial zone covers most of the study area. This zone is fluvial originated and characterised by low lying homogeneous flat surface. On the basis of Bhuvan Geomorphological map of West Bengal (2005-2006), this alluvial zone is divided into following geomorphic units:

a) Younger alluvial plain
b) Older flood plain
c) Active flood plain

From the above-mentioned geomorphic units, fluvial origin younger alluvial plain is found in the lower part of the study area. Active flood plain has been developed along the active channel of River Sankosh but old flood plain stretches over the left bank of the River Sankosh at mid-stream whereas river shifting scenario is very common. It is mentioned that River Sankosh and River Raidak-II is confluences very near to the old flood plain. Northern part of study area is almost covered by piedmont plain of fluvial origin but spatio-temporal changes of geomorphic landform are very common phenomena in the alluvial channel. Moreover, among all of these identified geomorphic features of lower basin of River Sankosh, younger alluvial plain is mostly found which suitable to agronomic and allied activity.



Source: Resourcesat-1 LISS III

Map 2.2: Geomorphology of the Study Area

2.1.4.1 Relief of the study area: The relief (Map 2.3) is the difference in elevation between given two points. The maximum basin relief is the difference in elevation between the confluence at the river Brahmaputra and upper part of the study area. The study area is basically

under the plain region. The northern part of the study area is a part of piedmont plain is located at the foothill of the Himalaya and the southern part of the study area is under the monotonous plain region. Relief ratio strongly influences the sediment loss since the force exerted on the surface of the study area and it is directly related to relative humidity in one hand and rainfall and vegetation cover of the study area also affect in sediment loss on the other hand. On the basis of elevation, the study area has been classified into various relief zones. These are:

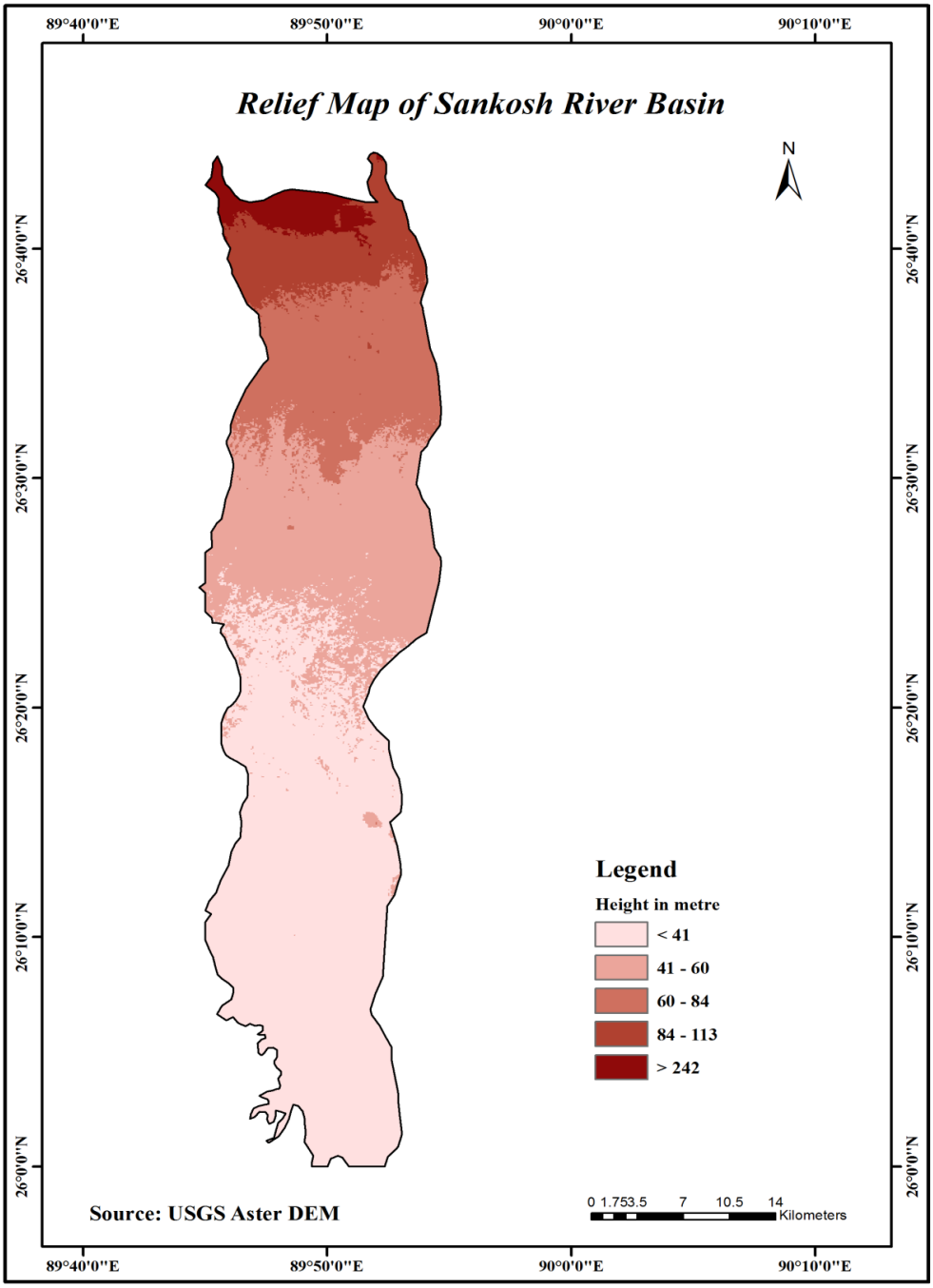
a) Low relief zone (below 50m): Lower part of the study area; along the Downstream.
b) Medium relief zone (50m to 100m): Middle part of the study area; along the Midstream.
c) High relief zone (above 100m): Upper part of the area; along the upstream.

2.1.4.2 Physiography: Physiographically, the study area can be divided into two sections. These are:

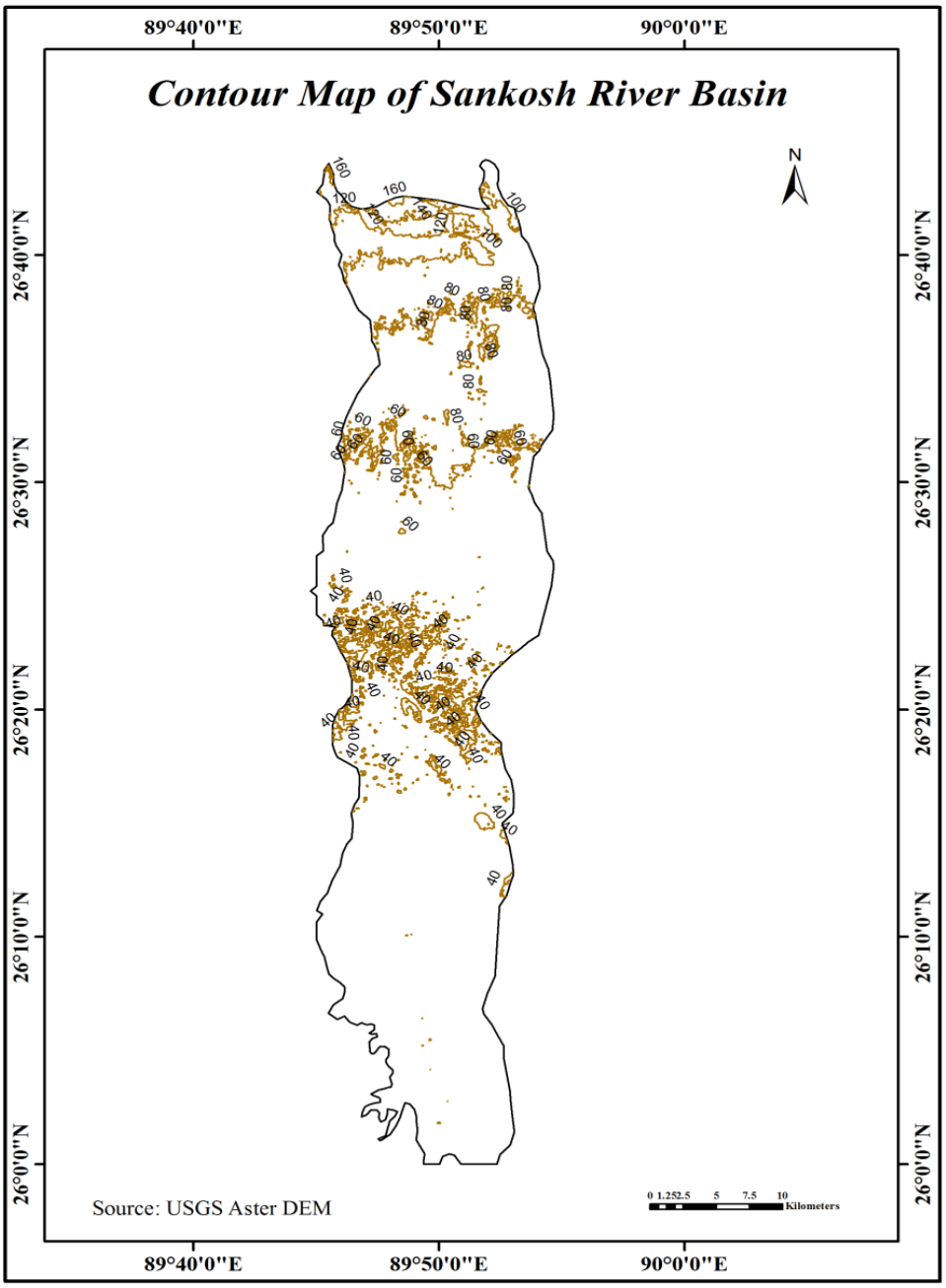
a) Piedmont region: The northern most part of the study area is under the piedmont region comprising Kumargram C.D. blocks of Alipurduar district of West Bengal and Gosaigaon C.D. block of Kokrajhar district of Assam.

b) Plain region: Most of the part of the study area is under the plain region. This plain region may be varied from place to place on the basis of their formation. Younger flood plain is found in the lower part of the study area comprising most of the land along the River Sankosh.

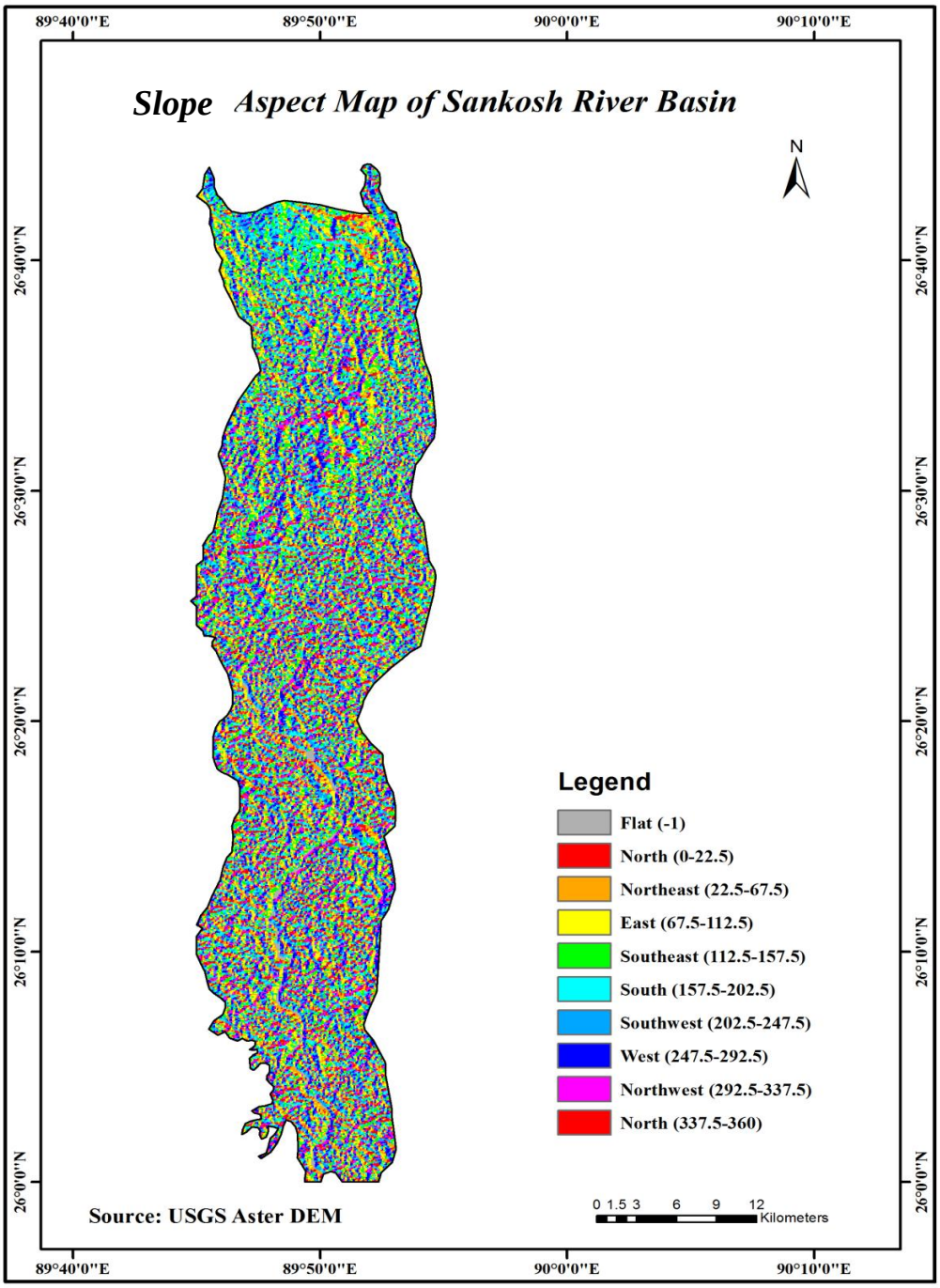
2.1.4.3 Slope and Slope aspects: Slope (Map 2.6) is one of the most important physical aspects of basin geomorphology and it is the **result** of both endogenic and exogenic forces. Slope may vary from place to place due to the influence of different factors like structure, process, geology, climate, relief etc. and form different degrees of slope. In the study area, high slope range, from 5% to 15% is found in foothill zones in the north of the study area and beyond this most of the study area is under the very low slope region. The average slope of the study area is about 9° and the general slope direction is from north to south. It may be mentioned that some small upland areas occur in parts of Kokrajhar district where slope is high with the value of 18.01° while at the confluence (near River Brahmaputra) the slope is very low e.g. 0.56°.



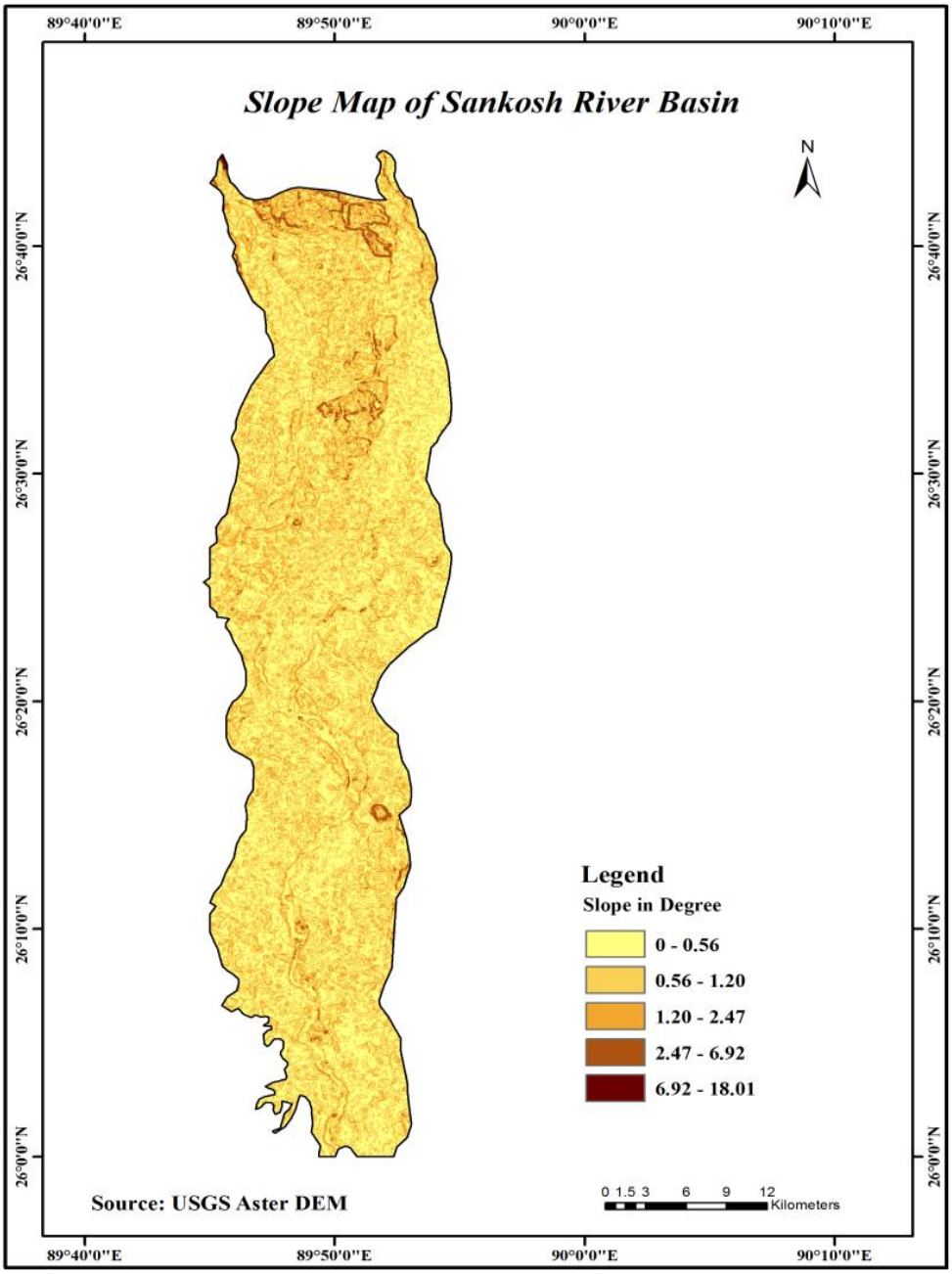
Map 2.3: Relief Map of Sankosh River Basin



Map 2.4: Contour Map of Sankosh River Basin



Map 2.5: Slope aspect Map of Sankosh River Basin



Map 2.6: Slope Map of Sankosh River Basin

2.1.4.4 Drainage Network:

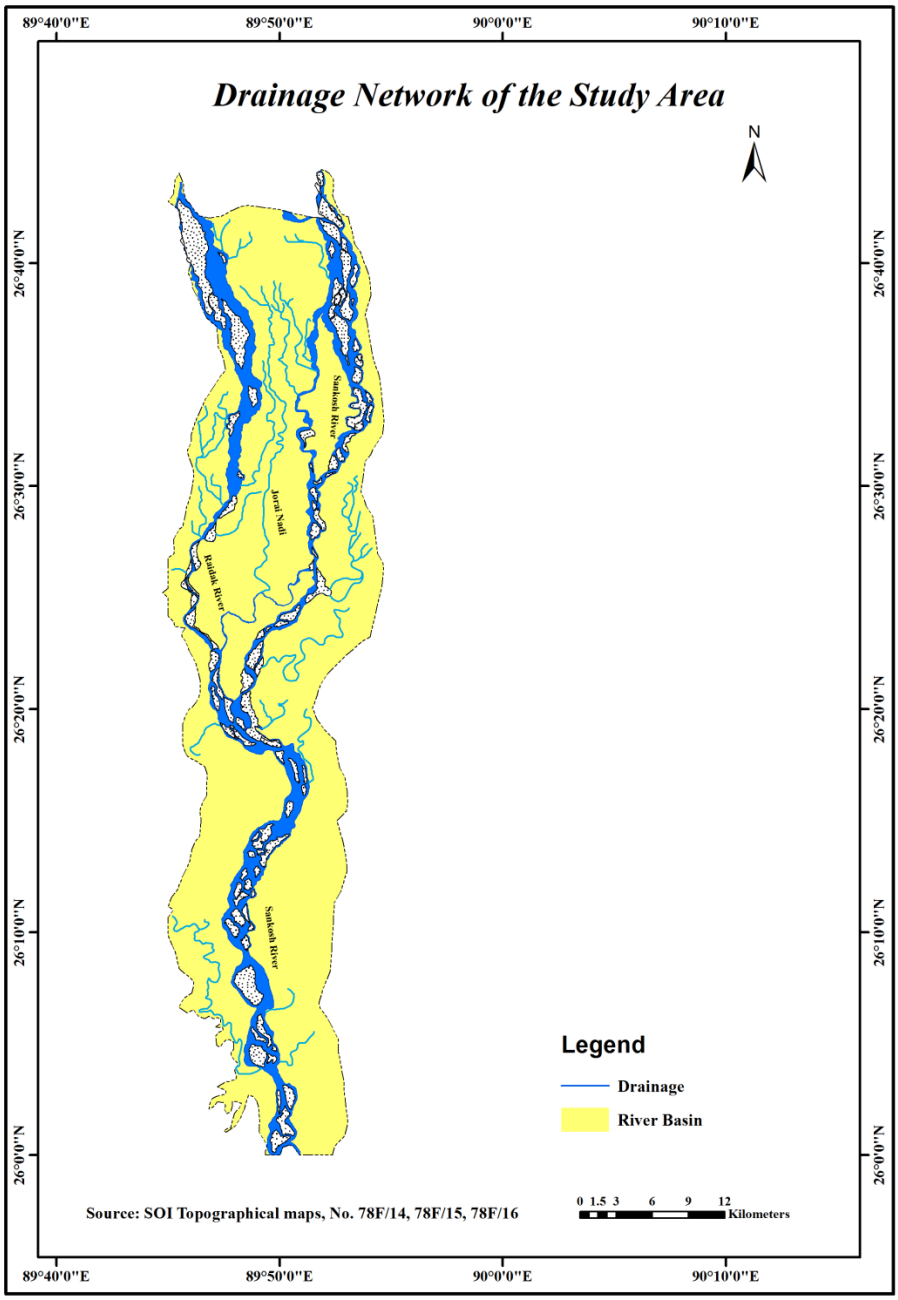
The River Sankosh (Mo-Chu) originates from the Bhutan Himalaya and marks the border between West Bengal and Assam. The catchment area covers an area of 10746 sq. km. out of which only 1012 sq. km lies in sub-Himalayan part of West Bengal and Assam (fig:). The River Sankosh is characterized by its highly notorious and unpredictable nature, heavy inundation and sedimentation during flood and problem of lateral bank erosion, bank line shifting, and channel avulsion, cut-off (chute cut-off and neck cut-off), multiple development of abandoned channels and paleochannels etc.

The River Sankosh which in its upper course is called as the Puna Tsang Chhu and its lower course named as the Gangadhar, comes from the territories of independent Bhutan and after a course of 7 miles through the Duars, the first five of which form the boundary between the western and eastern duars and the lower two lie through the Guma duars, enters the district from the east in the south-east of taluka Garbhanga, just where a small stream of the name *Takulla* falls into it from the north. From the mouth of the Takulla the river flows south-east, and then south, along the north-west of taluk Falimari, when it receives on its right bank the river *Jorai* in the south of Garbhanga and the *Raidak* –II in the south of Jaldhoya (Census of India, 1961).

Drainage network (Map 2.7) of the studied basin includes some tributaries and distributaries coming from the northern Sub- Himalayan zone. Of the tributaries of the Gadadhar, the *Raidak*-II is by far the most important. It is the easternmost of the two rivers of the same name and is formed within the Weastern duars by the union of two rivers, the Ghoramara and the *Kulkuli*, both of which came from southern slope of Bhutan hills. The next tributary is the *Jorai* and it is a small channel rising in the Bhaluka forest (Duar), the upper portion of which is called the *Gholani*. Only a short time ago the river instead of flowing east through Jaldhoya, poured south by the east of Mahishkhuchi, and passing the Bunder and Police out-post in that taluk, fell into the Gadadhar in the south-west of Pherusabari (Census of India, 1961).

The study area bounds in marshes, beels and small pools of stagnant water. These are remnants of the old beds of river which have not wholly dried up, which in many places faithfully retain the names of chhara, dara, beel, doba or kura (Census of India, 1961). Of the numerous beels and

chhara the following are the abandoned channel of Sankosh River: *Nayachhara, Purbachhara, Khalisamari beel, Kamandanga beel, Tamanadi* etc.



Map 2.7: Drainage Network of the Study Area

2.1.5 Climate:

The study area is fully lying in the tropical region and influenced by tropical monsoon climate. The principal characteristics of this climate are a cold and foggy winter, a moderately cool spring and a fairly temperate but very humid summer. January is the coldest month and mean temperature is about 16°C and on the other hand maximum temperature is found in the month of June. There is a marked difference in temperature and rainfall (Figure 2.1) between northern and southern part of the study area due to seasonal variation and as well as the altitudinal variation. An analysis of the temperature and rainfall data of the study area helps to bring out the variation of climate and its impact upon the basin area.

2.1.5.1 Seasonal Variation:

The study area has been enjoying four dominant seasons in the whole year. These are as follows:

2.1.9.1.1 Summer season (May to September)
2.1.9.1.2 Autumn Season (October to November)
2.1.9.1.3 Winter Season (December to February)
2.1.9.1.4 Spring Season (March to April)

2.1.5.1.1 Summer season:

This is the largest season in the study area. In this season, Temperature goes up daily with humidity. The average temperature in this season is about 28^0 C. The maximum temperature is recorded in the month of June and humidity varies from 87% to 58%. Northern part of the study area experiences high humidity due to excessive cloudiness. In this season, maximum rainfall occurs by South-West monsoon wind. The study area received highest rainfall in the months of June to July. Rainfall variation is also found from northern part to southern part of the study area (figure 2.1), water discharge becomes high in the basin area and different erosional activities go up.

2.1.5.1.2 Autumn Season:

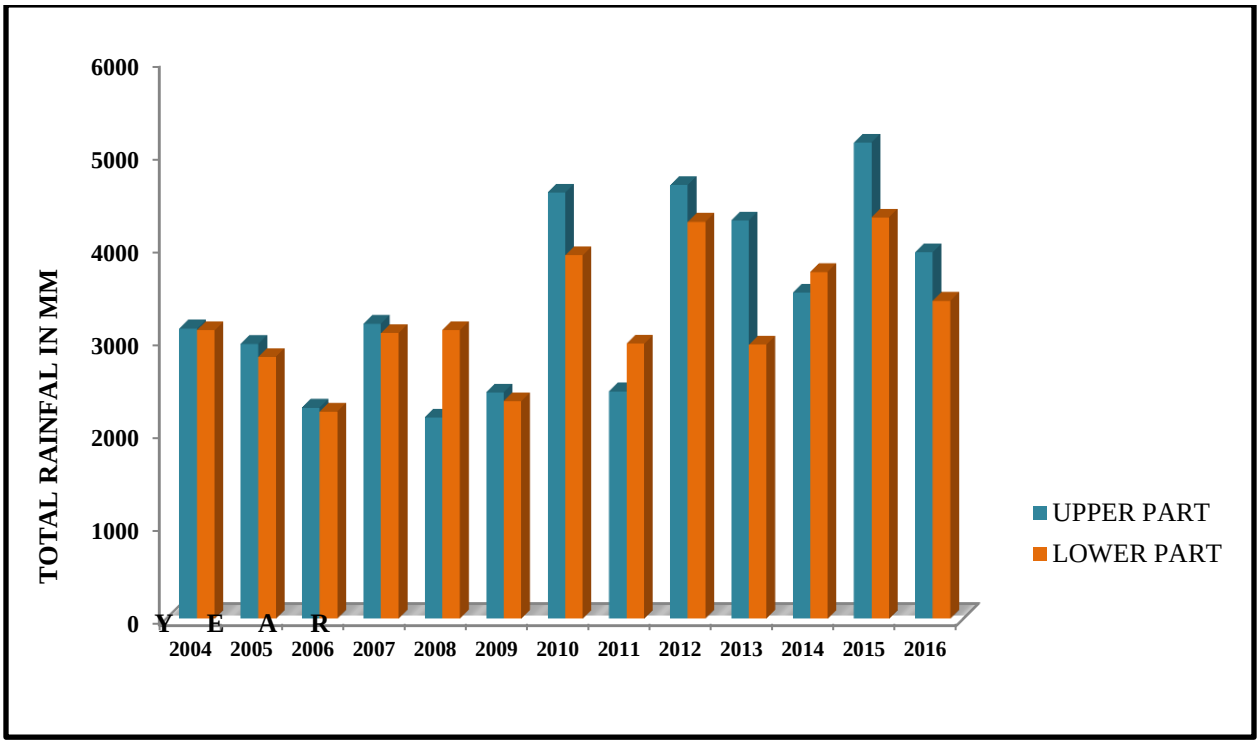
Temperature and rainfall both decrease in this season. Sometime, cyclonic rainfall occurs in this season. In the beginning of this season high temperature is found and it gradually falls down.

2.1.5.1.3 Winter Season:

The study area enjoys cold weather and the minimum temperature is recorded in this season. Most of the time of this season becomes foggy and dry. The lowest temperature is about 10^0 C found in the month of January. Rainfall rarely occurs in this season.

2.1.5.1.4 Spring Season:

Spring is the most pleasant season among the all seasons. Temperature gradually rises, but the weather remains dry. Very little rainfall occurs in this season.



Source: Kumargram and Barokodali Farmhouse of Alipurduar and Tufanganj respectively, 2016

Figure 2.1: Comparison of Annual Rainfall Distribution in the Study Area

2.1.6 Soils of the Study area:

Soils of the study area are alluvial in nature. Most parts of the study area are covered with fertile alluvial soil. But many tracts of the study area especially where the bank erosion is dominant,

sandy soil is found. The soil of the study area is alluvial of recent formation and has an admixture of sand which is known as sandy loam. The soil properties like sand silt and clay varies from place to place of the study area. The river causes flood in every year and its effects on soil formation in the study area and the soil properties are frequently changed due to the deposition of sediment. Anthropogenic activities like mining in Bhutan, dam construction, deforestation etc. also affect the rate of soil formation in the lower course of the river basin. Soils of the study area are characterized by sandy, highly acidic, heavily leached and poor in base and plant nutrients. On the basis of NBSS and LUP soil map, the study area is divided into four different soil zones, (Map 2.8). These are as follows:

i) Fine loamy to coarse loamy
ii) Course loamy
iii) Coarse loamy to Fine loamy
iv) Fine Coarse loamy

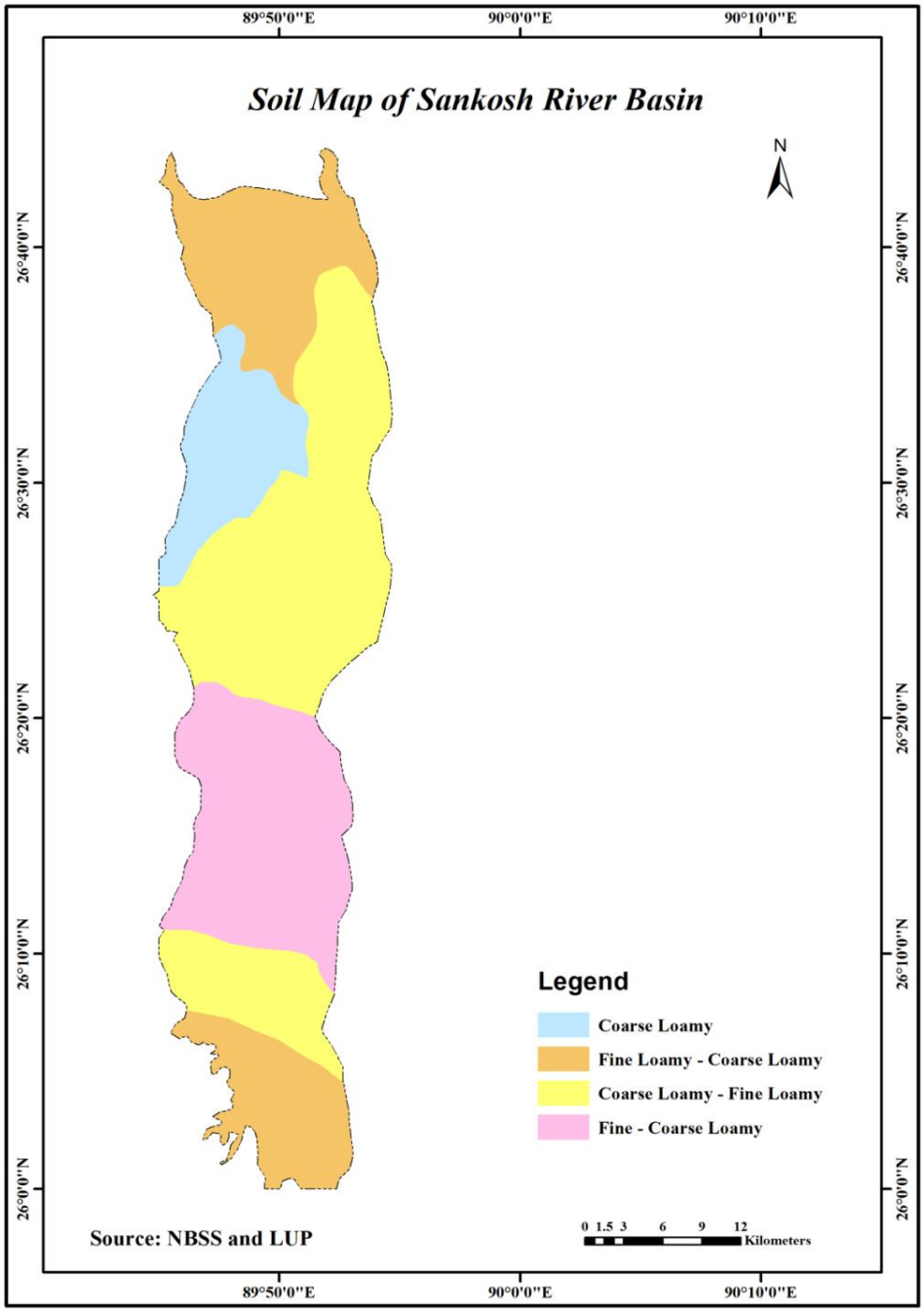
This soil is superlative for the cultivation of paddy, jute, vegetables, maize etc. The turbulent water of different rivers carry huge amount of detritus material, which have an adverse effect on crop production as well as the hydrology of the study area. Recurrent floods have also been affecting the quality of the soil and cultivation. The colour of the soil varies from ash to black (Census, 1971).

2.1.7 Natural Vegetation:

Northern part of the study area is predominantly covered by forest. It is one of the most prominent wildlife areas of the state of West Bengal and Assam. The forests of the study area can be broadly classified into four categories, namely riverine forest, plain forests, hill forests and Savannah forests. Near the streams and moist area, occur a type of evergreen forest is known as North Bengal tropical Evergreen forest. (Forest Survey of India,1999)

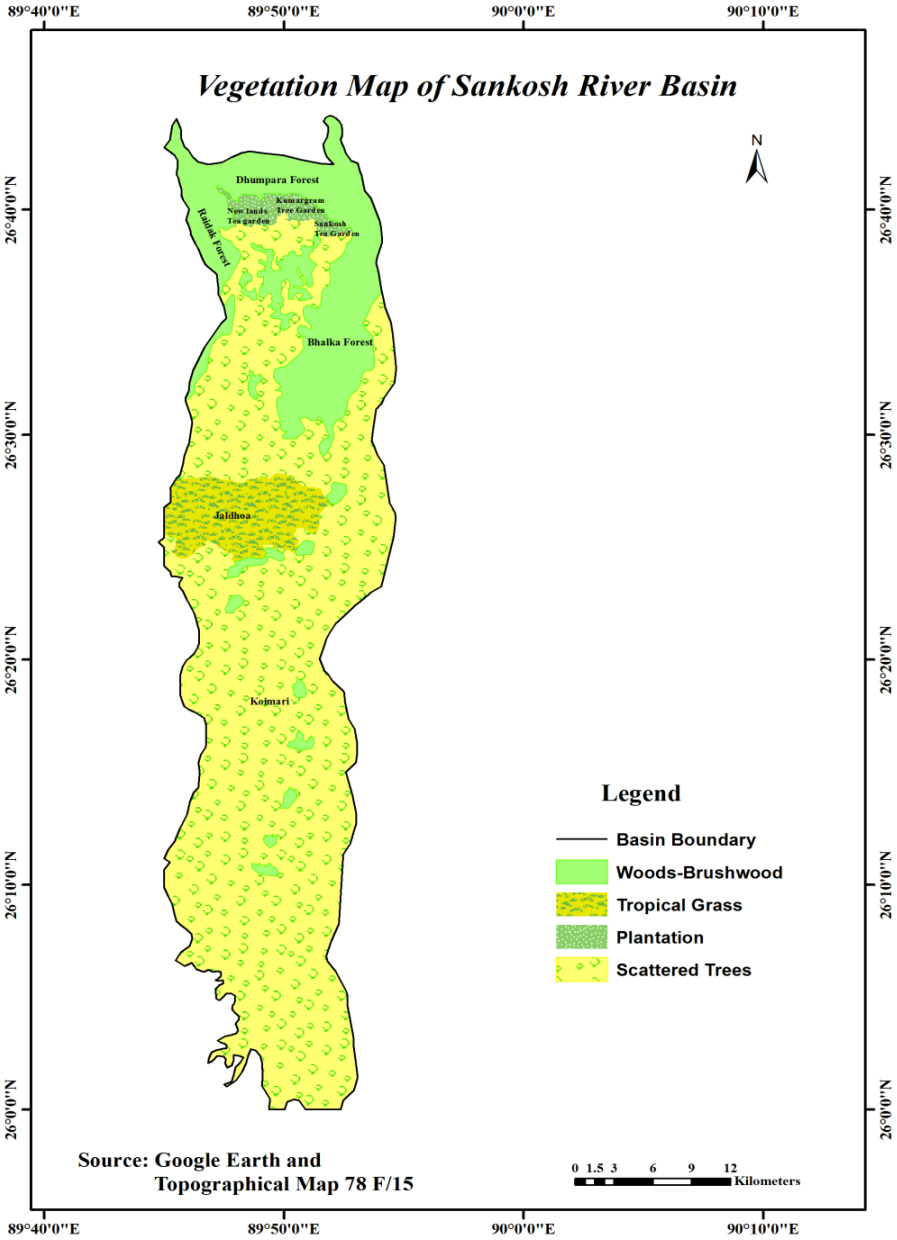
The study area is predominantly covered by the moist tropical forest. From the field survey it is observed that the northern part is covered by reserved forest and tea garden whereas the southern part of the study area is covered by mixed vegetation. Most notable reserved forests are woods-brushwood and tropical grass and the major predominant tea gardens are Raidak tea garden, Turturi tea garden, Kohirer tea garden, Sankosh tea garden etc. On the other hand lower and

middle part of the study area is covered by open mixed jungle, scattered plants, riverine forest



etc.

Map 2.8 Soil Map of Sankosh River Basin



Map 2.9: Vegetation Map of Sankosh River Basin

2.2 Socio-Cultural set-up of the study area

2.2.1. Introduction:

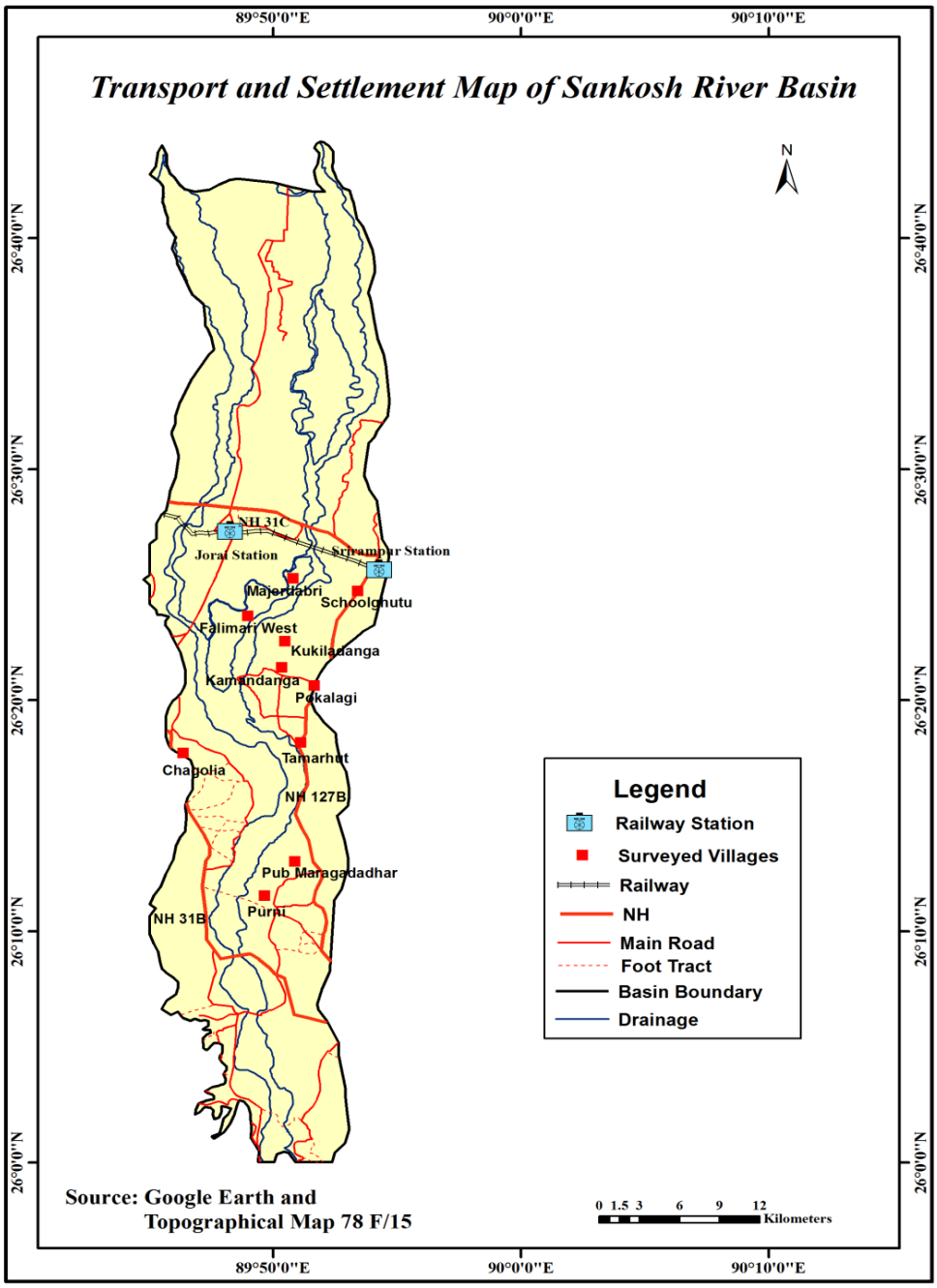
Socio-cultural set up of the study area include different components i.e. population, settlement, occupational characteristics and transport and communication etc. All these components are here after discussed in below under the following headings.

2.2.2. Population:

Population forms an important component in the whole process of socio-economic and as well as cultural development of any area. The people inhabited in the study area and along the abandoned channels of Sankosh River belongs to agrarian family and some people also in habitat in the char, called as char dwellers, face very poor economic condition in their daily life. The maximum concentration of population on the both bank of the Sankosh River belongs to Rajbanshi and Muslim community. Some other concentration of population belongs to tribal community. On the basis of caste category, Scheduled Caste population is highly distributed in the study area and then Other Backward Classes both A and B, General caste, Scheduled Tribes are distributed respectively. People of the study area carried different culture on the basis of their customs and heritage and also their livelihood.

2.2.3. Settlement:

People are settled on the both bank of the River and along the abandoned channels for the advantages of available fertile land, use of water for irrigation and other purposes, fishing facility etc. Most of the People built their houses by using the materials like tin, bamboo, dry jute stripes and some other peoples settled in pucca houses also. The settlement pattern along the abandoned channel is mostly formed linear type whereas other places of the study area compact and semi compact settlement patterns are found.



Map 2.10: Transport and Settlement Map of Sankosh River Basin

2.2.4. Transport and Communication:

Transport and communication (Map 2.10) is a pre requisite for any kind of socio-economic development. In the study area, Transport and communication is poorly developed in comparison to other places of both states. In the upper part of the study area, a National Highway (NH-31A) is passing from west to east and on the other hand, NH-31B is passing over the study area in lower reach. Some state High way and other pucca and kutcha road are also poorly distributed over the study area.

Communication system is poorly developed in the study area. Only few post offices viz. Falimari post office of Tufanganj-II block of Coochbehar District of West Bengal and Koimari post office and Tamarhat post office of Kokrajhar District of Assam etc. are dominantly distributed in the study area where as other means of communication system like telegraph and telephone line and others are poorly developed.

2.2.5. Occupational structure in the study area:

Agriculture is considered as dominant occupation of the people in the study area. Out of total population, more than 65%of population engaged in the occupations of cultivator and agricultural labourer. On the other hand, more than 29.2% of population engaged in other activities and 3% in household occupation respectively in the study area. Beyond these some other allied economic activities has also observed by the people are selling of vegetable, vendors etc.

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