Chapter II

General Background of the Study Area

Chapter II

General Background of the Study Area

2.1. Introduction

The subdivision of Siliguri, the study area, is one of the subdivisions of Darjeeling District of West Bengal. It is the northern most districts West Bengal and also known as the Terai of Darjeeling District. It covers mostly the thick alluvium and partly the piedmont plain of Mechi- Mahananda interfluves which is referred to as Chicken neck. The study area lies between 26^0 27' N to 26^0 57'N of latitude and 88^0 07' E and 88^0 31' E of longitude and is represented by parts of the Survey of India (SOI) toposheet no. 78 B/1, 78 B/2, 78 B/3, 78 B/5. 78 B/6 and 78 B/9 on the scale of 1: 50,000. The subdivision contains of Siliguri Municipal Corporation and four community developmental (CD) blocks: Matigara, Naxalbari, Phansidewa and Kharibari. The four blocks contain twenty two Gram Panchayats and two census towns: Bairatisal and Uttar Bagdogra. The study area excludes the Siliguri Municipal Corporation being predominantly urban area. The subdivision is bounded in the eastern side by Jalpaiguri district, in the northern side by Kurseong and Mirik Police stations of Darjeeling district, in the southern side by Chopra block of Uttar Dinajpur district and partly by Bangladesh and western side by Nepal.

Matigara block is located at 26˚43’ N of latitude, 88˚23’E of longitude. It has an average elevation of 127 metres having an area of 140.60 km^2. It consists of one Census Town: Bairatisal and five gram panchayats, viz. Atharakhai, Matigara-I, Patharghata, Champasari, and Matigara-II. Naxalbari block is located at 26˚68’N latitude, 88˚ 22’E longitude. It has an average elevation of 152 metres above sea level. This block occupies an area about 181.51 km^2. This block consists of one census town: Uttar Bagdogra and six gram panchayats, viz., Gossaipur, Lower Bagdogra, Naxalbari, Hatighisa, Moniram and Upper Bagdogra. Phansidewa block is located at 26˚58’N latitude, 88˚36’E longitude. It has an average elevation of 98 metres above sea level having an area about 336.56 km^2. This block consists of rural areas only with seven gram panchayats, viz., Bidhannagar-I, Chathat-Bansgaon Kismat, Ghoshpukur, Jalas-Nizamtara, Bidhannagar-II, Phansidewa-Bansgaon Kismat and Hetmuri-Singhjhora. Kharibari block is located at

26˚34’19”N, 88˚08’51”E. This block covers 143.50 km^2. This block consists of rural areas only with four gram panchayats, viz., Binnabari, Buraganj, Kharibari-Panisali and Raniganj-Panisali.

2.2. Physical set up of the study area

The mountainous flat plains of North Bengal merge gradually into the rising series of serrated peaks of the mighty Himalayas through the Terai, a gently sloping land, partly covered by river-borne deposits and partly by rocks of regions farther north. The hills of the Darjeeling district encroach right upon the Terai. The high hill and the flat gently sloping plains of the Terai are separated by a series of earthen terraces of Pleistocene and Post-Pleistocene age-one rising higher than the other, thus forming a series of somewhat flat-topped cliffs overlooking the plains. These terraces finally merge into the base of the hills at an elevation of 500 to 700 m. innumerable streams having their sources far in the high hills descend through deep precipitous gorges, only to appear in the foothills below as sluggish rivers with wide and shallow beds, forming semi-circular alluvial fans at the debauchers. Most of these rivers remain dry during the cold weather, but carrying tremendous rush of silt-laden water during the monsoon and floods are not uncommon.

The physical set up — geology, relief, drainage, climate, soil and natural vegetation, influences, the agriculture in many ways. They determine the type of crops, the timing of agricultural operations, the extent of risk involved in agriculture and improvement of agriculture. The social and economic factors also influence the many aspects of farming systems, but they can operate only within the limits set by the physical environment. In this chapter, therefore, the physical and socio-economic environments which appear relevant to the pattern of agricultural land use are presented.

2.2.1. Geology

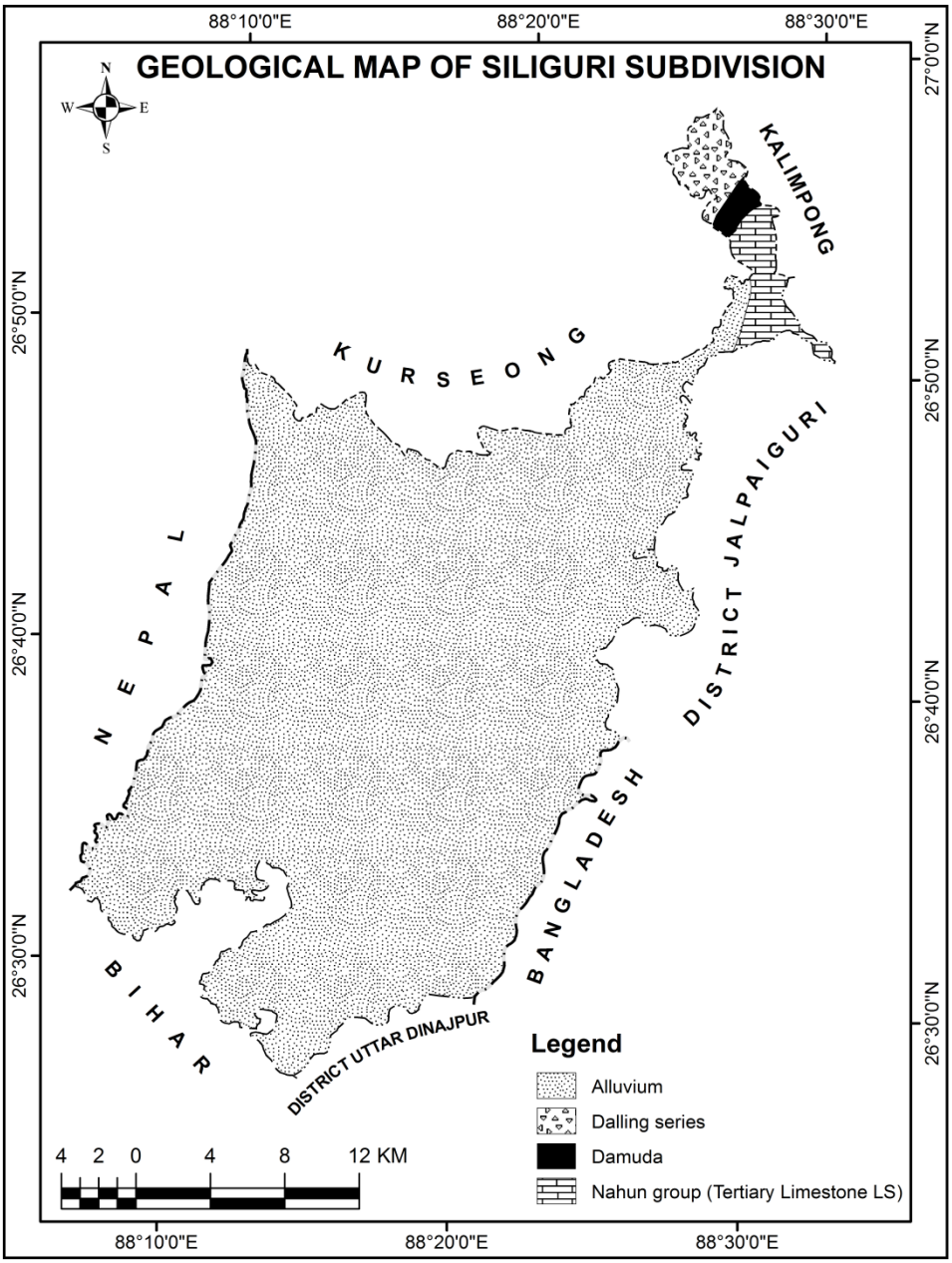
Stratigraphically and petrographically, the whole region shows features of unusual variation. The first group of rocks to be met with, while going northward from the plains of newer alluvial deposits are the Siwaliks (Nahun Series), made up of hard and highly feldspathic and slightly micaceous sandstones, pebbles of quartz and schist. Along the entire base of this Siwalik zone there occurs a continuous belt of stratified and

unstratified deposits of gravels, boulders, sands and clay thus forming a sort of transition between the hills and the plains.

The tertiaries, occurring to the north of the Nahun Series, are represented by an east-west running belt extending from the Mechi to the Lehti River, and after a conspicuous absence for over 64 km reappears near the buxa hills. The Siwaliks are separated by a continuous thrust-fault from a narrow east-west running belt of the Gondwanas (Permo-Carboniferous). This belt gives place to the Daling in the north and east of the Diana River. The Daling series gives place to a younger formation of the Buxas farther east. The Daling intrude far inside the plains of Bengal by a series of spur and promontories, through the Siwalik.

Table 2.1 Geological sequence of Darjeeling District, accordance to Mallet and Auden

AGE	FORMATIONS	LITHOLOGY
Recent	Sub-aerial formation or recent Alluvia	Sand, silt and clay
Pleistocene and Sub-Recent	Alluvial deposits or Drift Formation	Older alluvium boulder bed and other sands and gravels
Miocene to Pliocene	Siwalik	Unconformity upper tertiary, Sandstone, Mudstone, Slate and Pebble beds within bands of Limestone and Lignite
Permo-Carboniferous	Lower – Gondwana	Main boundary fault, fine to medium grained quartzitic sandstones, interbedded within slate beds, carbonaceous shales and thin seams of flaky coal.
	Buxa Series	Thrust Fault Slate, Schist, Quartzite and dolomite as a narrow band
	Daling Series	Thrust Fault Slate, phyllite, Mica Schist of different grades of metamorphism
	Darjeeling Series	Thrust Fault Fine grained augen and branded gneiss often granitiferous.



Source: Adapted from Mallet

Figure 2.1 Geological Map of Siliguri Subdivision

2.2.2. Relief

Siliguri subdivision is located to the southern foot-hill zone of Darjeeling Himalaya. As the area guided by the high hills of the lesser Himalayas in the north and gentle alluvium

in the south, so the major part of the study area is composed of unconsolidated materials, derived from the Himalayas and brought down by the rivers originated from these hills. The average surface elevations along the north-south direction are respectively 350m and 300 m above mean sea level. The general slope of the area is north-east to south-west directions.

Studying the cross-section, it is visualized that there are a number of break in slopes and variation in slopes at different heights, indicate the area under tectonic activities. On the basis of slopes, contours and cross sections, nature of erosion, composition of materials and drainage characteristics, the study area is divided into three micro-divisions:

A. Structural Hills
B. Piedmont Plains
C. Terai Plains

A. Structural Hills: A small northern portion of the study area which is a part of Siwalik formation are forming hogbacks and cuestas having high relief of rugged profile with some structurally controlled drainage. The general height of the Siwalik is more than 260m. above mean sea level. Headward erosion by the rivers in the Siwalik, scarp face and moderately steep slope in the higher part of the hills are significant features in the study area. The dip direction is toward the south-west and parallel to the topographical slope. As a result, flat topography has been formed in the lower part of the hill and the higher part is highly dissected by the streams and rivers. The structural hill is highly forested.

B. Piedmont Plains: Long sloppy lands from the hills to the plains known as Piedmont plains originated from materials of the Siwalik as well as the lesser Himalayas. The Piedmont plain has been divided into two parts---

a. Upper Piedmont Plain and
b. Lower Piedmont Plain

a. Upper Piedmont Plain: This plain is a depression part of the lesser Himalayas and is filled with unsorted boulders, cobbles, pebbles, gravel, sand, silt and clay. Its general height ranges from 200-260m from north to south.

b. Lower Piedmont Plain: This plain is filled with unconsolidated materials like

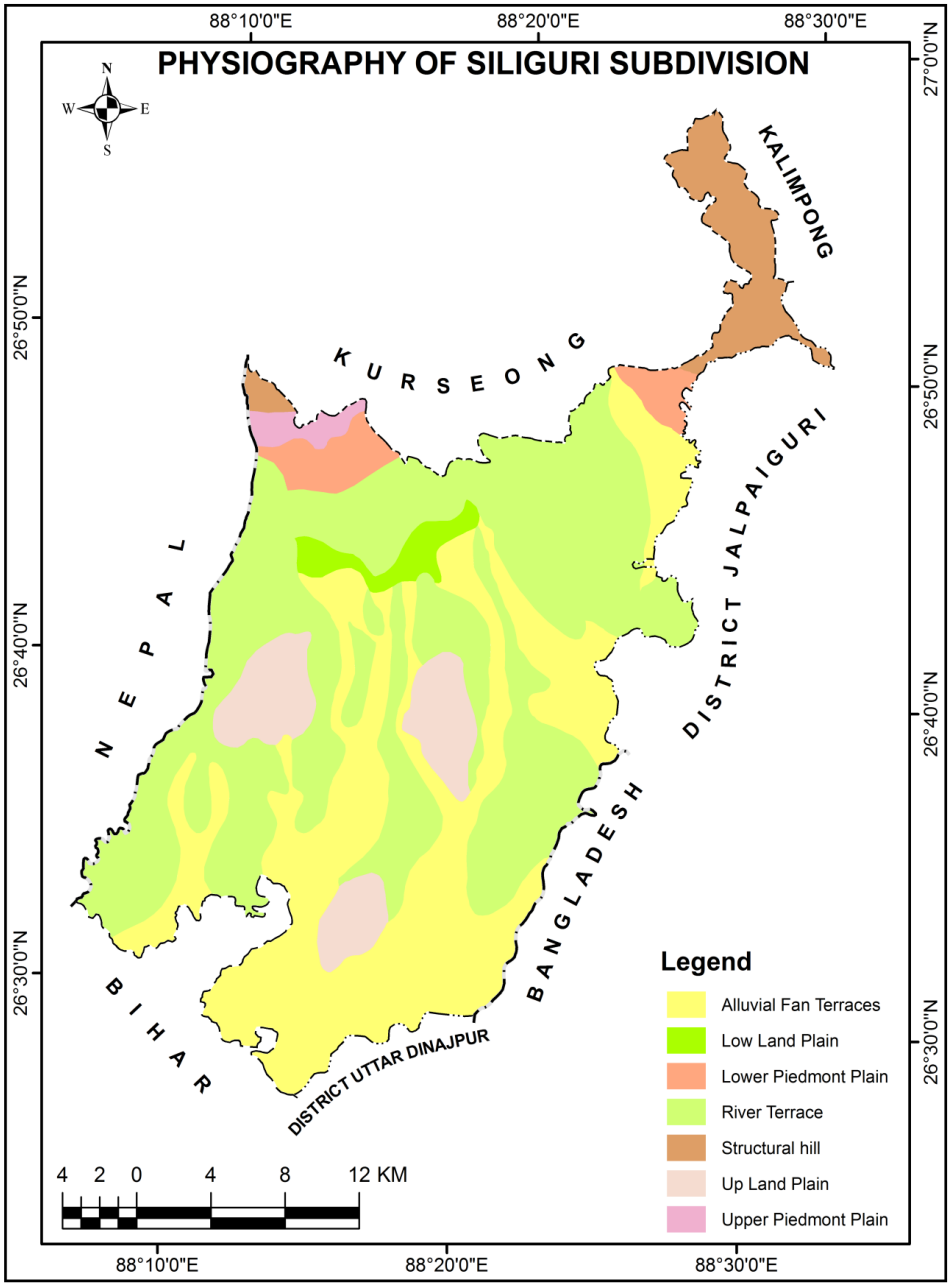


Figure 2.2 Physiography of Siliguri Subdivision

loose sand, gravel, silt and clay. The average height of this plain ranges from 120-200m having a moderate to gentle slope towards the southward direction.

C. **Terai Plains:** It is located south of the Piedmont plain with a gentle southerly slope. The junction of the Terai plain and the Piedmont plain is well marked by the presence of a spring line from where originate a number of springs. This plain

covers a large part of the study area. The general height ranges from 40 to 120 meters above mean sea level.

I. Plains: The plain is composed of the alluvium brought down by the Mahananda, Balason and the Mechi rivers and their confluence. This zone consists of a few conspicuous topographical features. The general slope is from north to south. Physiographically, the area can be divided into----- the upland plains of older alluvium and the lowland plains of newer alluvium.

II. Terraces: The general height varies from 35 to 60 m and the slope is very gentle having southerly face. Terraces may be further classified into two groups:

a. River Terraces: River Terraces indicate different levels of older flood or low land plains that have undergone repeated upliftment due to changes in long physical, climatic and tectonic conditions. Terraces at different levels are quite prominent in the Mahananda, Balasan and Mechi rivers.

b. Alluvial Fan Terraces: Geomorphologically, these were intensive fluvial action as a result number of fluvial fans were developed.

2.2.3. Drainage System

One of the distinct characteristics of the major rivers of North Bengal is that they undergo drainage inversion from converging drainage in the hills to divergent system in the plains. Most of the channels, otherwise dry during the lean period, drain considerable volume of water during the monsoon months. The changes in the gradient of their long profiles too are significant. Most of the rivers are mostly large. All the rivers of North Bengal plains are international in the sense that they flow through India and Bangladesh in the lower reaches and through Nepal, Bhutan in the upper courses. The rivers are flowing in a braided channel. The rivers of North Bengal can be divided into two systems; namely Mahananda system and Teesta system. All the rivers are originating from clad mountains and they are perennial in nature. Rivers dominate the topography of the Terai. The courses may be divided into three sections: (a) hill section, where the rivers confine their waters within deep gorges or defiles and the course of the river is more or less fixed; (b) the course of the river between its debouchure from the hills to the plains, where semi-circular fans are formed by the deposition of the boulders and the coarser soil particles.

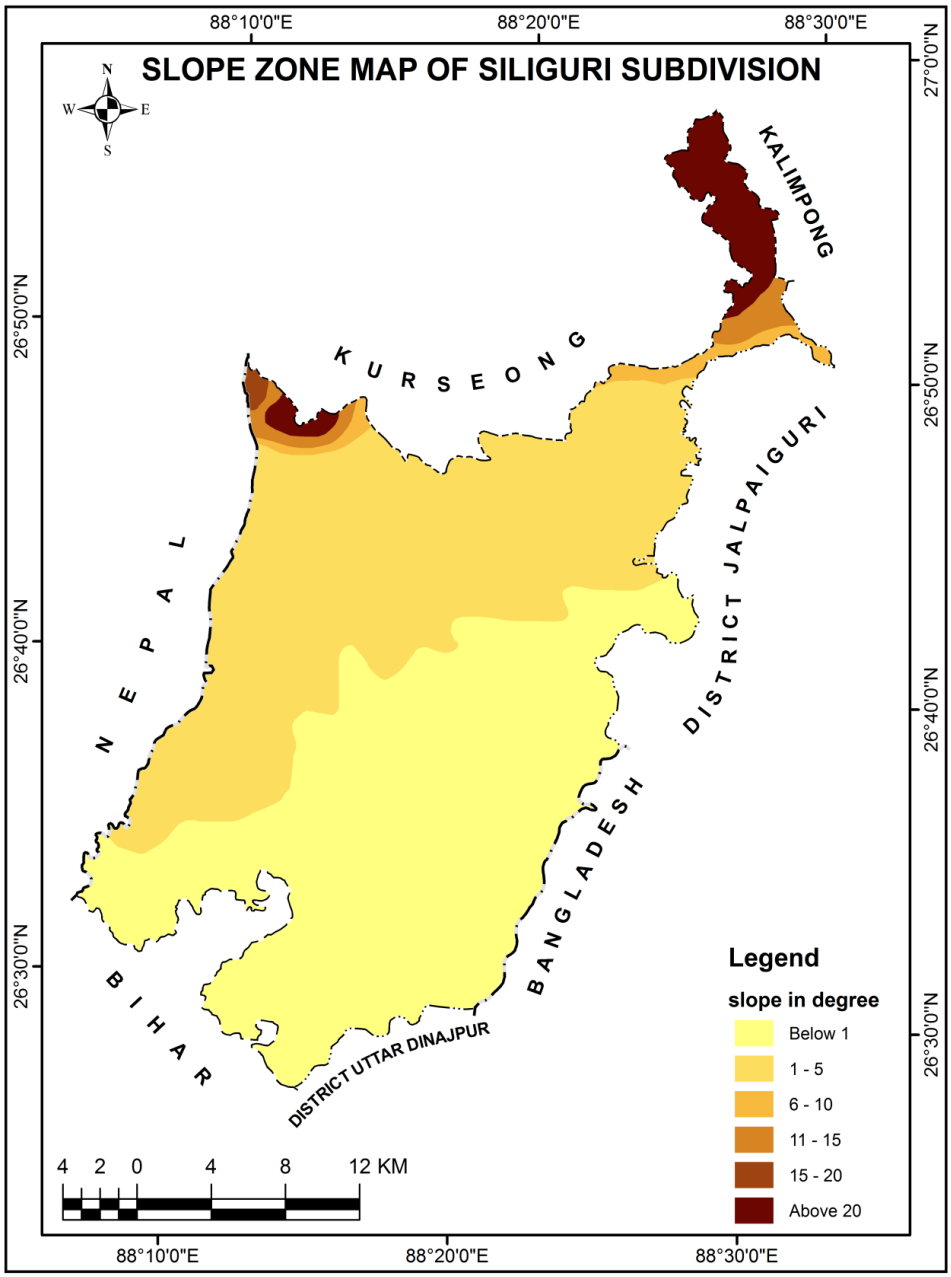


Figure 2.3 Slope Zone Map of Siliguri Subdivision

Water percolates through these rocky beds only to appear again a few miles further south and (c) the swampy region formed by the reappearance of the streams. The region is generally covered by dense jungle. From west to east, the most important rivers to be met with are the Mechi, which forms the boundary between Nepal and Darjeeling district, the Balasan, the Mahananda and the Tista. The Teesta, flows for a short distance through the Terai, receives no tributaries from the area. It flows into the Brahmaputra and the

Baikunthapur jungle mahal, therefore forms the watershed in the Terai, between the Ganges and the Brahmaputra. The Terai is the westerly plain district in north-east India where tea is grown. Here the gardens are concentrated between the Mechi, the old Balasan and the Mahananda rivers.

A. The Mahananda River: The eastern boundary of the study area is the Mahananda River, which originates at Mahaldiram in the Darjeeling district at an altitude of 2060m. Its catchment area receives a high amount of rainfall in monsoon. After debouching the hills, the Mahananda flows south as far as Siliguri, where it changes its direction to the south-west and forms the boundary between the study area and Jalpaiguri district and finally it enters into Bangladesh through Chapai Nawabganj District. The river finally flows into Ganges. There are a number of tributaries namely, Trinai, Ronchandi and Dauk.

   The Balasan River: The Balasan rises from Lepchajagat Peak on the Ghum. Simana saddle and flows south almost parallel to the 88˚15’ E meridian till it reaches the plains at an altitude of 300 m and then turns south-east where its valley is larger than that of the Mahananda. On entering the plains it is divided into two branches one called Old Balasan and the other is New Balasan which joins the Mahananda just below Siliguri. There are a numbers of terraces in the foothills of the mountain. The volume of water that flows through the new channel is considerable. There are many tributaries of the river. Among these Pulungdang Khola, Rangbang Nala, Manjwa Jhora, Dudhia Jhora and the Chenga are to be mentioned.

B. The Mechi River: It forms the boundary between Nepal and India and it rises at an elevation of 905m south of the west facing Rangbang spur of the Singalila range and flows through deep gorge throughout the hilly course. It descends into bhabar tract where its bed suddenly widens. The Mechi flows past Lohagrah tea garden. The left bank tributary of Mechi is Kiyang Khola and joins at an altitude of 635m, the Ashi Jhora and the Mana Jhora. It changes its course several times due to floods and other tectonic activities. The old and new Mechi are several km apart but flow in same direction. The river is important from the point of view of irrigation.

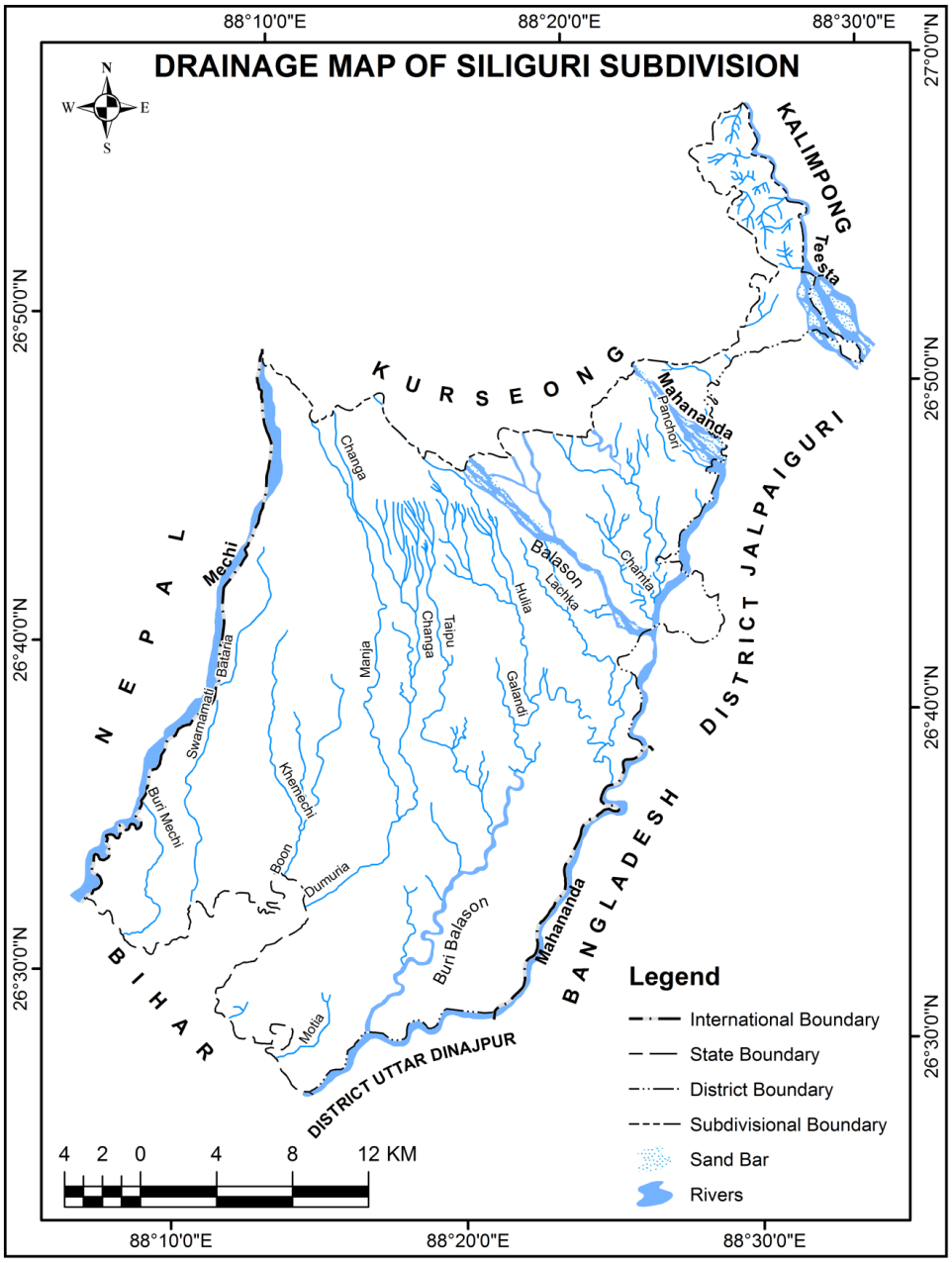


Figure 2.4 Drainage Map of Siliguri Subdivision

Table 2.2 Name of the rivers flowing: Block-wise

Name of the Block	Name of the River
Matigara	Mahananda Nadi and Teesta Nadi
Naxalbari	Mechi Nadi and Balasan Nadi
Kharibari	Mechi Nadi
Phansidewa	Mahananda Nadi, Buri Balasan, Galandi

2.2.4. Climate

The climate of the study area being adjacent to hilly tract is chracterised by humid atmosphere and abundant rains, with temperature being seldom excessive. The area receives a huge amount of rainfall influenced by the South-West monsoon. The average rainfall of the area is 225 cm to 275 cm. Rainy season starts from the month of June and continues till the month of September. The temperature of the area in summer is not too high with an average of 28 ^{0} C and in winter, it is about 16 ^{0} C. January becomes the coldest month in the study area.

Table 2.3 Climate of Siliguri Subdivision

Climate Features	March to May	June to October	November to February
Rainfall (mm)	376.6	2134.0	42.6
Air Temperature Max. (˚C)	32.3	31.3	26.0
Air Temperature Min. (˚C)	20.5	24.5	12.8
Relative Humidity %	60.0	81.0	70.0
Dewfall	Low Significant	Not Significant	Very Significant

Source: West Bengal State Report vol. II (Jalpaiguri Division)

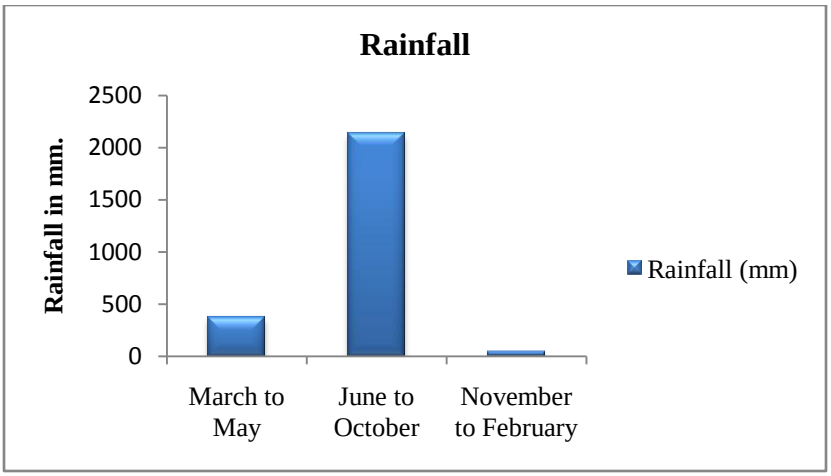


Figure 2.5 Rainfall of Siliguri Subdivision

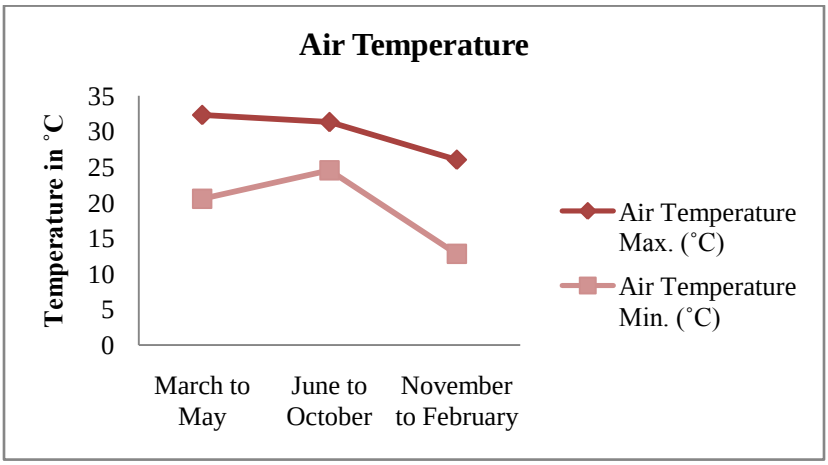


Figure 2.6 Air Temperature of Siliguri Subdivision

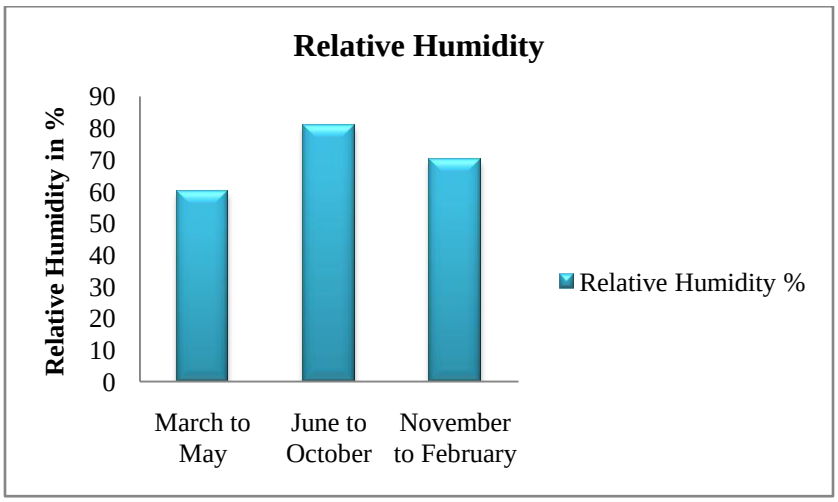


Figure 2.7 Relative Humidity of Siliguri Subdivision

2.2.5. Soil

The soils of the study area are divided into three broad groups:

1. Grey Sandy Loam (New Alluvium)
2. Yellow Sandy Soil (Mal Sands)
3. Red Earth (Red Bank Soils)

1. Grey Sandy Loam: This type of soils occupies the riverine tracts of the Terai and the Duars. The soil is composed of grayish sands formed of gravels and sands. This is the most fertile agricultural tract of North Bengal. This type of soil is highly acidic but the organic composition of the soil is lower.

2. Yellow Sandy Soil: This type of soil occupies extensive areas between the river Torsa, Teesta and Dima. The soil has developed by the action of rivers of the Terai and Duars. The rivers are the Mahananda, the Mechi, the Balasan, the Teesta and the Torsa. Yellow sandy loam soil is rich in organic matter but the clay content of the soil is remarkably low, the ultimate result of which is leaching. All the organic matter is transported downward. In this way all the acid and iron components are accumulated in the lower layer. This soil is chemically rich due to podzolization. (Banerjee, 1954).

3. Red Earth: The red earth occupies the transitional zone between the Darjeeling hills and the plains. The soil occupies the areas from Rohini and long view to the plains, in the Duars, the soil is found between Lehti and Diana rivers. This typical soil has high percentage of clay, alumina and iron oxides. This soil has the highest percentage of clay fractions followed by coarse sand, fine silt etc. But this soil differentiated from water borne soils.

2.2.6. Natural Vegetation

Vegetation mainly depends on climate and soil hence there is good relationship between soil and vegetation in an area. In the study area, there is thick cover of vegetation, which is highly associated with the nature of slopes. The area of steep slopes in the north and north-west side, i.e. Sukna, Panighata etc places are thickly vegetated by simul, mixed sal, khair, siris, sissoo and large healthy bamboo forest. The area of moderate to gentle slopes are more conspicuous, smaller trees like the wild banana is most abundant, its

crown of beautiful foliage contrasting with the smaller leaved plants amongst which it nestles. The screw pine with a straight stem and tuft of leaves, each 3 or 3.5 m long is found in the southern part of the study area where slope is gentle and soils can easily be rooted compared to the area of steep slopes.

Gentle slopes and high fertility are the major factors for dense vegetation in the low land of Terai area. Most of the area is vegetated by the abundant bamboo bushes. Twenty to thirty species of fern are also observed in the lower terraces as well as upper terraces. Weeds and grasses are thickly vegetated in plains of the study area.

2.3. Socio-economic set up of the study area

The role of physical factors in agriculture has been discussed in previous section. Farming is a product not only of physical environment but also of socio-economic factors. Therefore, here the analysis of the relevant socio-economic factors which influence the land use pattern is made. It includes a study of population, occupational structure, land holdings, irrigation, transport and communication and market centers.

2.3.1. Population Composition

2.3.1.1. Growth of Population

The waves of displaced people from East Pakistan (now Bangladesh) started since 1950-51. As per the 2011 census provisional report, the decadal growth of population is 14.47

Table 2.4 Growth of Rural Population and Decadal variations in Siliguri Subdivision (1991-2011)

Year	**1991-2001**	**2001-2011**
	Decadal variations (%)	Decadal variations (%)
Matigara	40.90	64.53
Naxalbari	54.64	25.31
Kharibari	37.80	23.77
Phansidewa	22.38	19.24
Total	38.53	32.49

Source: District Census Hand Book, Census of India 1991, 2001 and 2011

percentages with registering a growth of 3.23 and 38.00 percentages of rural and urban population in the district. The decadal growth of total population in the Siliguri subdivision is 18.40 percent while this figure shows the decadal growth of rural and urban population of the subdivision to 32.49 and1.81 percent respectively.

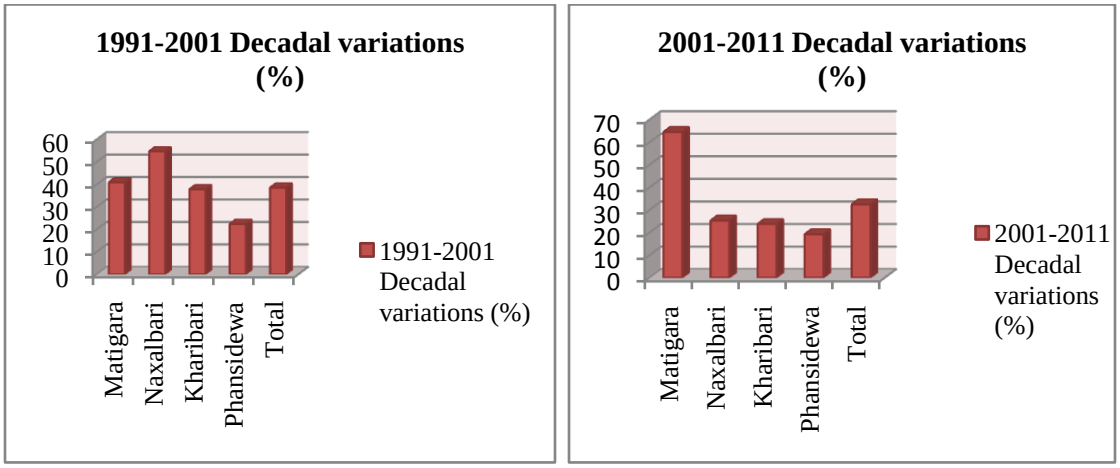


Figure 2.8 Decadal variations in Siliguri Subdivision (1991-2011)

2.3.1.2. Rural and Urban Population composition

As per the 2011 census provisional report the percentage of rural population to the total population in the Darjeeling district is 72.29. The percentage of rural population in the study area accounts for 51.02 to the total rural population and 36.88 percentages to the total population of the district respectively. However, the percentage of rural population is 70.10 percent in respect of the total population of the Siliguri subdivision.

2.3.1.3. Density of Population

The density of population of Darjeeling district as per the provisional data released by

Table 2.5 Block-Wise Density of Rural Population in Siliguri Subdivision

Blocks	Area (Sq. Km)	Density (1991)	Density (2001)	Density (2011)
Matigara	143	375	904	1426
Naxalbari	182	154	797	890
Kharibari	145	279	609	754
Phansidewa	312	167	549	655

Source: District Census Hand Book, Census of India 1991, 2001and 2011

census of India is 585 persons per sq. km. In 2001, the density was 511 persons per sq. km in the district. On the other hand, the density of rural population as per 2011 census is 869 per sq. km in the study area which was 656 per sq. km in the census year of 2001.

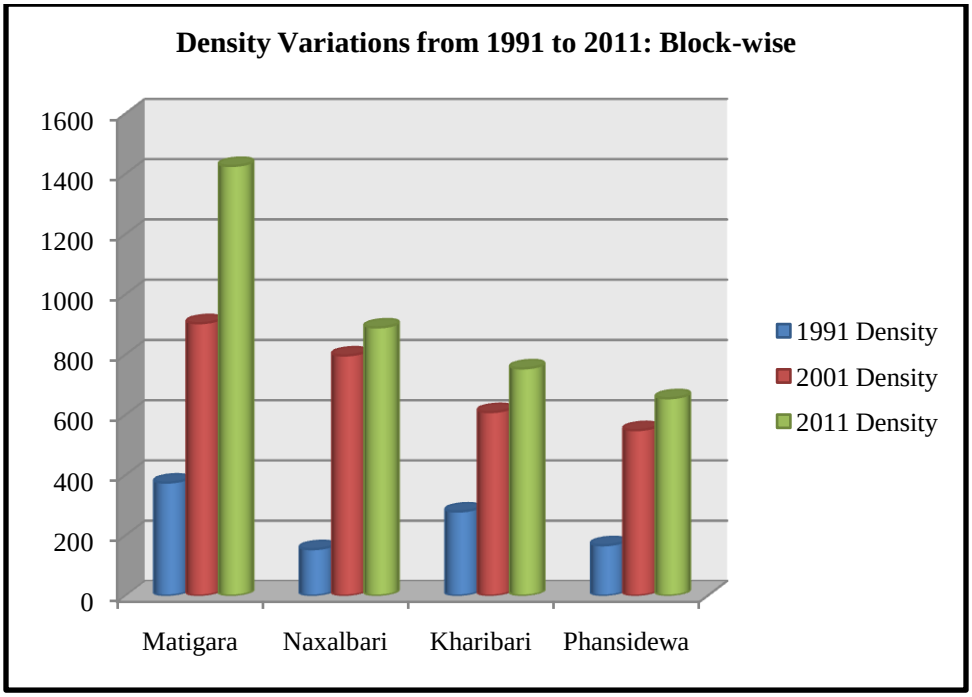


Figure 2.9 Density Variations from 1991 to 2011: Block-wise

2.3.1.4. Occupational Structure

Occupational structure refers to the distribution of working force in to the various sectors of economic activity. Working force in a country refers to that portion of population which is engaged in various productive activities in an economy. The size of working force in a country depends upon a number of factors, some of which are (a) size of population; (b) age and sex structure of population; (c) social attitudes towards work, particularly in case of women and children; (d) availability of job opportunities etc.

As per the census of India 1981, workers have been defined as those who are engaged in economically productive activity for a major part of the preceding year (at least six

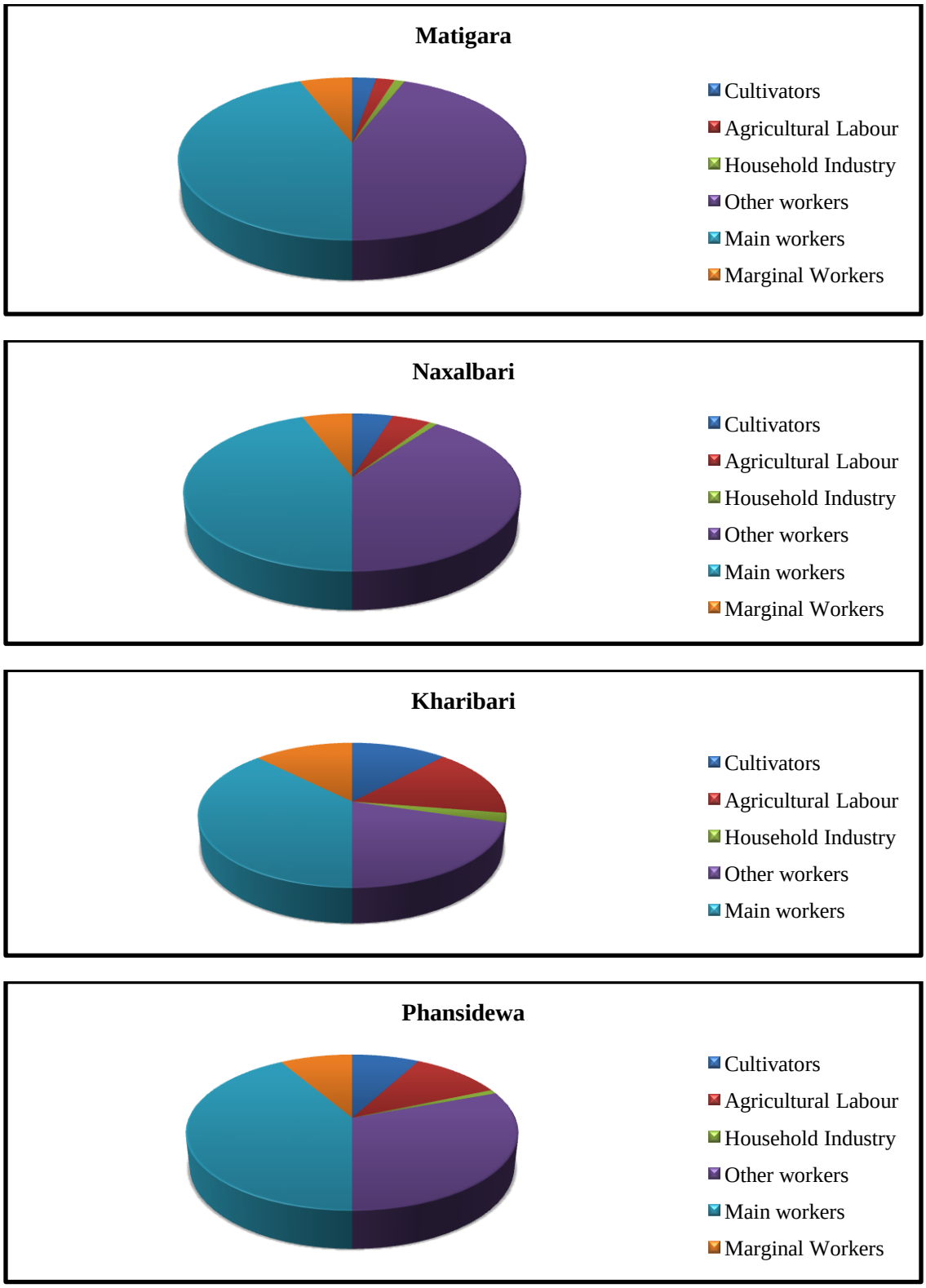


Figure 2.10 Block-wise Distribution of Workers in Percentage, 2011

months or 183 days), while marginal workers mean those who worked for sometime but not for the whole year (<183 days). According to 2011 census, the rural population of Siliguri subdivision accounts for 40.75 percent total workers to its total population comprising the main workers and marginal workers as 34.8 percent and 5.95 percent respectively.

Table 2.6 Block-wise Distribution of Workers in Percentage, 2011

Block/ Workers	Matigara	Naxalbari	Kharibari	Phansidewa
Cultivators	2.67	4.69	12.00	7.87
Agricultural Labour	2.07	4.46	15.51	10.63
Household Industry	1.14	0.90	2.10	0.85
Other workers	44.12	39.97	20.39	30.65
Main workers	44.13	44.24	37.51	41.55
Marginal Workers	5.87	5.74	12.49	8.45
Total Workers	24.44	23.83	18.33	33.40

Source: Survey of Rural India: A comprehensive study of gram panchayat and Community Development block, vol.25, West Bengal (2013)

Table 2.7 Different farming community in Siliguri Subdivision for the year 1991 and 2001

Name of Blocks	Bargadars		Patta holders		Small farmers Households		Marginal Farmers Households		Agricultural Labourers	
	1991	2001	1991	2001	1991	2001	1991	2001	1991	2001
Matigara	1034	1007	946	8665	1758	455	1055	6860	4357	1888
Naxalbari	1645	1617	1385	9522	4367	770	1617	7340	7633	3961
Kharibari	813	803	1052	7147	269	1435	1226	12495	9477	10591
Phansidewa	2231	2221	3220	19258	669	3185	1722	17180	12763	13229

Source: District Statistical Hand Book, 1996-97 and 2006, Bureau of Applied Economics and Statistics, Govt. of West Bengal

The occupational pattern of rural population of the Siliguri subdivision also reveals that a significant portion of main workers are engaged in agricultural activities. As per 2011 Census, the different categories of total workers of the rural population of the

subdivision shows that 8.10 percent, 11.45 percent, 2.25 percent and 78.2 percent are engaged as cultivators, agricultural labourers, house hold and industrial workers, and other workers respectively.

2.3.2 Land Holdings

The agrarian sector of the district is largely dominated by small and marginal peasants. In fact, the numbers of large holdings as well as area accounted for are very negligible and have steadily declined in the study area over the years. In the year 2010-11, 68% of the holdings in the district are below 2 acres which covers 78 % area of total holdings.

2.3.3 Transport and Communication

Siliguri is well connected by road, rail and air. Siliguri has developed as an important node for all surface communication systems in this region. Siliguri is linked to the other parts of India and the neighbouring Himalayan Kingdom's by N.H. 31, N.H. 31-A, N.H. 55, lateral road and a number of major state highways (S.H. 12, 12A.) . All the three types of railway links viz. broad gauge, meter gauge and narrow gauge connect the Siliguri with the National Capital and a large number of other State Capital and Darjeeling Hill Station. Siliguri is also connected by air links from Bagdogra with the National Capital and a number of other State Capitals by daily services. All types of modern telecommunication facilities and postal services are available in Siliguri.

Table 2.8 Distribution of Transport Network in Siliguri Subdivision: Block-wise

Block	Roadways	Railway Station
Matigara	NH-31(Guwahati to Kashimganj), NH-31A (Gangtok to Guwahati) and SH-12 (Kurseong to Matigara)	Sivok Forest, Galmakhari, Matigara Hat
Naxalbari	NH-31 (Uttar Bagdogra to Siliguri) and SH-12 Krishnaganj to Siliguri)	Bhimram, Dumriguri
Kharibari	SH-12(Kishanganj to Naxalbari)	Kelabari
Phansidewa	NH-31 (Bagdogra to Islampur) and SH-12 (Naxalbari to Bagdogra)	Kalaram, Paschim Banshgaon

Source: Survey of Rural India: A comprehensive study of gram panchayat and Community Development block, vol.25, West Bengal (2013)

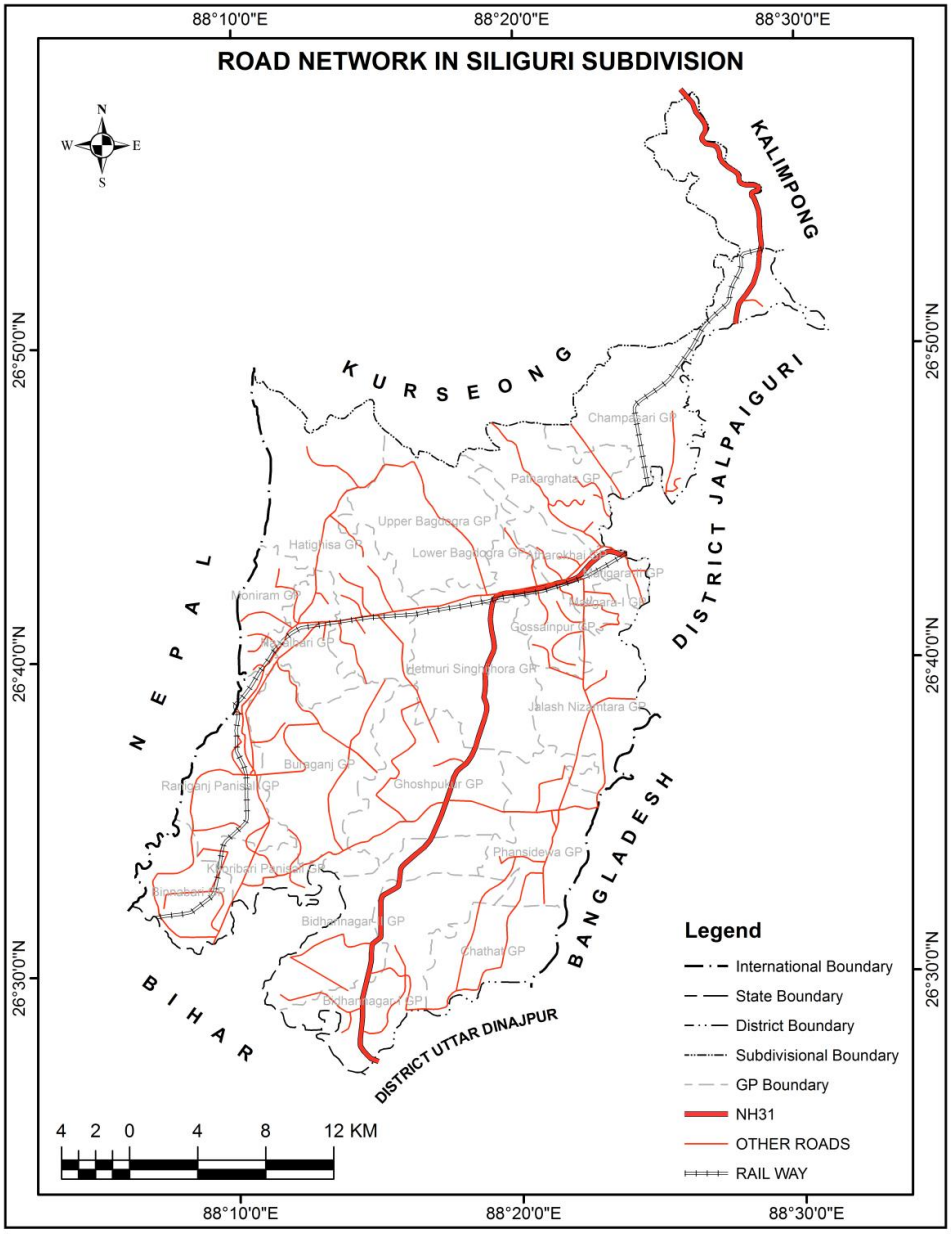


Figure 2.11 Road Network in Siliguri Subdivision

2.3.4 Market Centres

Market centre plays an important role in agricultural and regional economic development. Important market centres located in the study area are Matigara, Phansidewa, Salbari, Liusipukhri, Chathat, Bagdogra, Naxalbari, Kharibari, Bidhannagar, Ranagapani and Siliguri. All the market centres are connected by road and in many cases by railway system.

2.4 References

1. Das, M. (2006): Impact of terrain on agricultural development of north Bengal with particular reference to Darjeeling District, PhD Thesis, Geography and Applied Geography Department, University of North Bengal, Darjeeling, West Bengal.
2. District Census Hand Book, Census of India, 1991
3. District Census Hand Book, Census of India, 2001
4. District Census Hand Book, Census of India, 2011
5. District Statistical Handbook of Darjeeling 1996-97, Bureau of Applied Economics and Statistics, Government of West Bengal.
6. District Statistical Handbook of Darjeeling 2006, Bureau of Applied Economics and Statistics, Government of West Bengal.
7. O'Malley, L.S.S. (2001): Bengal District Gazetteers Darjeeling, West Bengal District Gazetteers, Department of Higher Education, Govt. of West Bengal, Calcutta.
8. Survey of Rural India (2013): A comprehensive study of gram panchayat and Community Development block, vol.25, West Bengal
9. West Bengal State Report vol. II (Jalpaiguri Division)