

A Brief Discussion about history and geographical Background of the Siliguri Subdivision

¹Tuhin Dey Roy and ²Arindam Basak

¹Research Scholar, Department of Geography and Applied Geography, University of North Bengal

²Associate Professor, Department of Geography and Applied Geography, University of North Bengal

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ABSTRACT

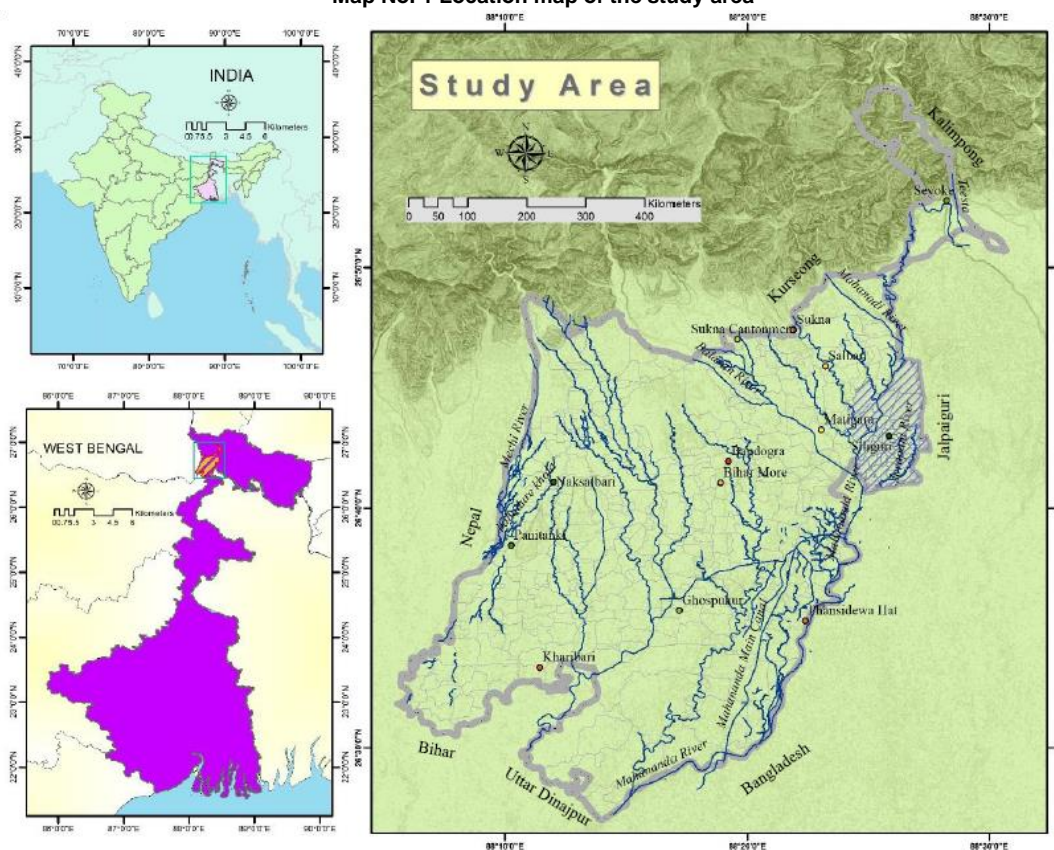
A geographical background of a region is very much an integral part of research. It helps to get an idea about the physiography, climate, geology, soil, drainage and natural vegetation which forms the mosaic of the physical background of the study area. In addition to these, brief history of this subdivision has also been dealt here in details. This will give a broad understanding of the geographical elements of Siliguri sub-division. Given this content each of these parameters has been discussed individually in the subsequent part.

Introduction

Siliguri sub-division, the study area is located at the base of Himalaya Mountain in the plain of the Darjeeling district. This subdivision is popularly known as 'Terai Land.' This region is also consider as 'Chicken neck corridor', a 'cartographic imprints of the British decolonization process is a terrifyingly vulnerable artery in India's Geography'. The latitudinal and longitudinal extension of the study area is 26°26'50" N to 26°58'00" N and 88°06'13" E to 88°31'03" E respectively. This area 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 geographical area is 819.61 sq. km consisting 4 C. D. Blocks, 22 Gram Panchayats, 14 Census Towns, 353 Villages and 1 Municipal Corporation under its administrative jurisdiction. This sub-division is bounded on the north by Kurseong sub-division and Kalimpong district, on south by Bihar, Uttar Dinajpur and Bangladesh, on east by Jalpaiguri district and on west by Nepal. In 2011 census, the total population of this region is 1189838 consisting 654617 urban population and 535221 rural population.

Map No. 1 Location map of the study area



Source: Prepared by the researcher

Brief history of Siliguri Subdivision

Documentation of the history of the study area is very limited. Siliguri's other name in Hunter's *Statistical Account of Bengal* was 'Sannyasikata'. In his books, Hunter made no mention of the term Siliguri. J.D. Hooker in his travelogue said that "Siligoree stands on the verge of the Terai, that low malarious belt which skirts the base of the Himalaya." The Baikunthapur Raikats were a subsidiary branch of the Cooch Behar royal family. A step brother of Maharaja Viswa Singha built a house adjacent to Siliguri during the reign of the region's first two kings, Viswa Singha and Naranarayan Raikat Siswasinha. That region of the kingdom was given to him as "pet bhata" (appanage) in the middle of the sixteenth century. Accordingly, "His (Siswasinha) capital was first built at Siliacguri (Siliguri) in the village of Debgram.....The capital was called 'Niz- Baikunthapur'. (Sanyal, 2002)" Darjeeling's history was first revealed in the 19th century, possibly as a result of the British Indian government's efforts to identify a Himalayan neighbouring region. The location was first mentioned in the Treaty of Tiliya of 1816, which was signed by the kingdom of Sikkim and the British East India Company.

As a part of this agreement British government have to protect the frontier of Sikkim from invasion. In this regard two officers of British East India Company try to solve the frontier problem between Sikkim and Nepal in 1828. One of these officers, General Lloyd spent six days in Darjeeling and was attracted by its scenic beauty. Given the cold weather of Darjeeling, later he planned it as a location of health resort. After the approval of the court of directors, he was successful in obtaining the execution of a grant deed by the Raja of Sikkim on the 1st day of 1835. Thereafter the territory of Darjeeling was further expanded with the annexation of the terai. Thus, 1866 represents a turning point in the district's chronology. After Kalimpong was placed under British control, the district was divided into two subdivisions: the Terai sub-division, with a land area of 274 square miles, which included the entire country at the foot of the hills, and the headquarter sub-division, with a land area of 960 square miles, which included all the hills on both sides of the Teesta.

It was difficult to travel between the Darjeeling district and the plains prior to 1866 because there was only a small route, which still remains today and was constructed in 1841 and passes via Pankhabari. In order to facilitate wheeled travel from the hills to the plains, the current Hill Cart Road was built in 1861 (Hunter, 1876). Simultaneously, a different road connecting Siliguri to the northern part of the Ganga was built, which helped Siliguri gain notoriety. (O'Malley, 1907). From 1864 until 1880, the Terai sub-division's headquarters were located in Hanskhawa close to Phansidewa before being moved to Siliguri. The Eastern Bengal State Railway Company subsequently built the railway line connecting Sealdah (Calcutta) and Damukia Ghat, which is currently located in Bangladesh close to the bank of the river Padma. In 1878, it was extended farther from the other bank of the Padma River at a location known as Saraghat to Siliguri via Nator, Santahar, Parbatipur, and Jalpaiguri (all of which are now in Bangladesh except Jalpaiguri). As a result, this allowed for continuous rail service between Siliguri and Calcutta. Then, in 1926, this metre gauge line was converted to a broad gauge line. Darjeeling Himalayan Railways, a different railway line was

built in 1881, connecting Siliguri to Darjeeling and increased the latter's significance.

In the Gazetteer of Darjeeling 1907, this place was declared by the authority as unhealthy and unhygienic and it was considered as a 'depot of malaria, typhoid' etc. In spite of these demerits, Siliguri was declared as a sub-divisional headquarters under Darjeeling district in 1907, thus re-establishing the Terai sub-division which had in 1891 been absorbed into the Kurseong sub-division. The population between 1907 and 1930 increased gradually but its overall development was not noteworthy, because till that time there was only one two-storied pukka (brick-built) building, which proves that 'Siliguri' though had by then a larger population, there had been little improvement in its performance. The establishment of schools and libraries between 1910 and 1930 was followed by the establishment of a club named the "Sporting Union" in 1920. Additionally, Siliguri has a strong history of the Swadeshi (Independence) movement, and Mahatma Gandhi addressed the people of Siliguri during his visit in 1925. After World War I, in 1919, transportation by modern vehicle began in Siliguri. Mr. Stephen, who had four motor cars and transported passengers to Darjeeling, utilized it for the first time. Each traveller paid Rs. 19 to get to Darjeeling. However, the Siliguri-Naxalbari route saw the beginning of the bus service for the Terai regions of Darjeeling in 1925. The first passenger bus was known as "Siliguri Motor Service." The bus's proprietor was Ganeshram Prasad and the first driver of the said bus was Md. Faridh.

When Siliguri's population reached about 7,000 people in 1931, it was officially recognized as a town for the first time by the Census of India. After that, this town's cultural life started to thrive, and in 1935 a movie was screened for the first time in the Mitra Sammilani Hall, which had originally opened in 1909 as the Bijalee Talkies and later changed its name to the Tripti Talkies. This town's cultural progress was further reflected in 1937 by the staging of a sizable number of traditional plays. Siliguri's population grew more quickly between 1931 and 1941, primarily as a result of the influx of immigrants from neighbouring districts in the south and nearby hills in the north.

According to the West Bengal Government's 29 April 1949 Gazette Notification, the Siliguri Municipality was created on May 24th, 1949, in accordance with the Bengal Municipal Act of 1932. It was first situated in a decrepit, one-story, little home with a tin roof owned by Mohammad Khudabox on the Hill Cart Road, directly across from the current Meghdoot Cinema Hall. The government appointed the first Chairman of the Municipality. By virtue of his position at the time, the S.D.O. served as the municipality's chairman. As a result, Sachindra Mohan Guha, the then S.D.O. of Siliguri, served as the first Chairman and Briendra Nath Roy Sarkar served as Vice-Chairman. Along with the aforementioned names, the State Government also nominated the following commissioners: Abanindranath Bhattacharjee, Pradut Kumar Basu, Bimal Kumar Mukhopadhyay, Digendranath Roy Sarkar, Manturam Agarwala, Bindheawari Misra, Rampada Chattopadhyaya, Dr. Khirodh Nath Chattopadhyay, Dr. Gopal Chandra Ghosh and George Mahbert. The Chairman was formerly employed by the government, but this practise was ended in 1956. The "Poura Bhawan" was built near the Siliguri court in its current position

on October 26, 1952, with the foundation stone placed by the West Bengal governor in office at the time, Harendra Kumar Mukhopadhyaya. Bireswas Majumdar gave the building its official opening on January 26, 1960. Jagadish Chandra Bhattacharya served as the new amendment act's first elected chairman. Thereafter, with the exception on a few occasions when an administrator served as chairman, the Siliguri Municipality's subsequent chairmen included Jiban Krishna Dutta, Krishnendra Narayan Choudhury, Swapan Kumar Sarkar, Asok Narayan Bhattacharya, and Bikash Ghosh. Though Siliguri was officially recognized as a town in 1931, but the local transportation was terrible. The municipality began licencing rickshaw pullers in 1952 and issued licences for 450 rickshaws. In 1951, the common people was first given access to power in this town through the Kurseong Hydro-Electric Power supply.

In the same year 1951, a college called "Siliguri College" was also established; up until 1971, it was the only college available to the people of Siliguri. After that, the Siliguri College of Commerce (1971) and the Siliguri Mahila Mahabidyalaya (1981) were established. After 1947, slum communities began to grow in and around Siliguri as a result of the massive influx of migrants from East Bengal (East Pakistan). During this time, the local market also began to expand as the flow of necessities expanded. The construction of the Siliguri railway junction in 1949 created a new pathway for direct communication with Bihar and the surrounding areas. The Siliguri Town Station is now connected via the pre-existing narrow gauge railway that ran along the Hill Cart Road thanks to the construction of Siliguri Junction station.

Due to the importance of the transport system during the war, the highways in and surrounding Siliguri were heavily utilized for the transportation of tanks and army vehicles during the 1962 Chinese invasion. For instance, the removal of the different stalls that were located on both sides of the Hill Cart Road significantly enlarged its width. Since then, there has been significant progress in roads, making Siliguri the main nodal point of the area. The Chinese incursion in 1962 brought the strategic importance of roads into the proper focus.

In the field of communication, the construction of the New Jalpaiguri Railway station in 1964 was a significant accomplishment. New Jalpaiguri railway station was connected to Siliguri Junction and Siliguri Town stations. The main reason for constructing the New Jalpaiguri Railway station was to establish a broad-gauge railroad line that would connect Siliguri and the surrounding areas with Calcutta. However, because the Farakka Barrage with road-cum-rail1 carriageways had not yet been built, the railway link between Siliguri and Calcutta was still going via Khejuria Ghat on the Ganga, which required using a boat to cross. Train communication between Siliguri and Calcutta became uninterrupted after the construction of Farakka Barrage in 1974. Notably, New Jalpaiguri became India's first railway station to feature all three gauges (i.e. broad, middle and narrow).

A political uprising over the language issue began in Assam in 1960, and as a result, a large number of Bengali population began moving to Siliguri and settling there. The Bangladesh War in 1971 caused a large influx of non-Muslim Bengalis, the majority of whom arrived in Siliguri and other North Bengal towns. Since the ULFA agitation in Assam began in 1980, there have been additional waves of migrants,

including bengalis, some of whom have settled in Siliguri and the surrounding area, particularly in Dabgram, leading to a rapid increase in its population. Siliguri's population grew after 1985, increasing the town's population and significantly increasing its land value. Under the leadership of Swapan Kumar Sarkar, the foundation stone for the Kanchanjunga Krirangan was laid, which will replace Tilak Maidan. Thereafter some development plans were made, to construct a second rail gate beside Town Station and prepare the connecting roads and broadening of Kachari road, Station Feeder Road, Burdwan Road, Bidhan Road and Sevok Road. In addition, the Refugee Rehabilitation Department opened Bidhan Market, named after the former chief minister of West Bengal, Dr. Bidhan Chandra Roy, on a three-acre tract of land for the benefit of 800 refugee vendors, at a cost of more than Rs. 10,000,000.

In the mean time, Siliguri was officially given Municipal Corporation status by the West Bengal Assembly on May 12, 1990, replacing Municipality. Siliguri Municipal Corporation was created in 1994 when Siliguri Municipality was transformed into it (S.M.C). It should be remembered that Siliguri Municipal Corporation includes both Dabgram Census Town and Siliguri Municipality (21.80 sq. km). Mayor is being used instead of Chairmen as a nomenclature. As the first Mayor of the Siliguri Municipal Corporation, Bikash Ghosh was chosen, and he has since been followed by Munsif Nurul Islam, Asok Narayan Bhattacharya, and Goutam Deb. The Siliguri Municipality initially had 8 wards, which steadily increased to 19 in 1964, 30 in the late 1980s, and finally 47 in 1994 when it was upgraded to a Corporation.

However, the Siliguri Planning Organization (S.P.O) was established on June 13, 1964, by the West Bengal government's Development and Planning Department, fifteen years after the Siliguri Municipality was founded. The S.P.O. created an interim development plan for Siliguri in 1965 with the intention of determining the city's future land use pattern. However, over time, it became clear that S.P.O was unable to address the myriad urban issues that Siliguri was facing. This was because the town's territory had grown beyond the administrative boundaries of Siliguri Subdivision due to urbanization, and now extends into the neighbouring Jalpaiguri district. In accordance with the West Bengal Town and Country (Planning and Development) Act of 1979, the Siliguri Jalpaiguri Development Authority (S.J.D.A) was founded on April 1st, 1980. This recently established S.J.D.A absorbed the earlier S.P.O. In 1986, the S.J.D.A. created an outline development plan for the 260 sq. km. of the S.J.D.A region that encompassed the entire Siliguri Municipality, measuring 15.5 sq. km. at that time.

The Sino-Indian War of 1962 was one of the key elements leading to a drastic change of the entire Siliguri sub-division. Because of this, the Indian government had a distinct perspective on Siliguri in order to guarantee security for North-East India. A variety of military offices and divisions were established up for the purpose of ensuring national security. In addition to this, this area saw the establishment of numerous military camps and stations for members of the Indian Army, Air Force, B.S.F., and S.S.B. In accordance with this, a variety of development initiatives and financial aid were given, aiding in the growth of this region. But the most intriguing part of this dramatic transformation of the entire Siliguri sub-division within

a short period of time is that the entire transformation took place without any development of large-scale industry. It would seem, at least on the surface, that there is no production base for this region. This is mostly a one-centric commercial hub that serves the expanding needs of neighbouring nations like Bhutan, Nepal, Bangladesh and North East India. Siliguri really served as a pull factor for population movement. This led to emigration from Siliguri's rural districts and from neighbouring Jalpaiguri district. Many employees are employed in non-agricultural activities. Additionally, it is interesting to note that the four c.d. blocks (Matigara, Nakshalbari, Phansidewa, and Kharibari) of Siliguri sub-division are significantly distinct in character from Siliguri. This block contains the majority of the agricultural activities as well as other related activity.

Administrative Divisions

Administration wise Siliguri Municipal Corporation comes under two district, Darjeeling and Jalpaiguri. Geographically this municipal corporation is situated within latitude of 26°42'N to 26°56'N and the longitude of 88°20'E to 88°29'E. It has an average elevation of 122 metres. Siliguri Municipal Corporation under Darjeeling district has an area of 20.1 sq. km. It consists of 33 Wards (Ward No. 1 to 30 and Ward No. 45 to 47). Siliguri Municipal Corporation under Jalpaiguri District has an area of 21.8 sq. km. It consists of 14 Wards (Ward No. 31 to 44).

Matigara block is located between 26°40' N to 26°57' N and 88°17' E to 88°30' E respectively. It has an average elevation of 127 metres and an area of 132.61 sq. km. Of these, rural area is 120.62 sq. km and urban area is 11.98 sq.

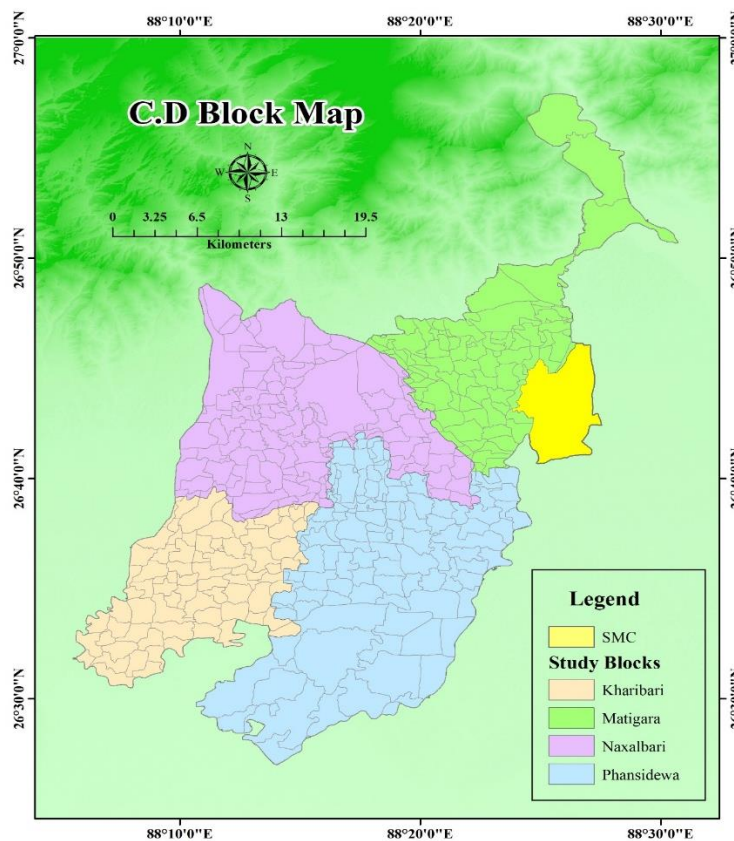
km. According to 2011 census it consists of six census towns, viz. Bairatisal, Tari, Jitu, Kalkut, Mathapari, Baramohonsingh and five gram panchayats, viz., Atharakhai, Matigara-I, Patharghata, Champasari, and Matigara-II.

Naxalbari block is located between 26°38' N to 26°48' N and 88°10' to 88°22' E respectively. It has an average elevation of 152 metres above sea level. This block occupies an area of about 188.12 sq. km. Of these, rural area is 173.67 sq. km and urban area is 14.45 Sq. km. According to census 2011 this block consists of six Census Towns, viz., Uttar Bagdogra, Lalman, Dakshin Bagdogra, Dumriguri, Geni, Bhimram and six gram panchayats, viz., Gossapur, Lower Bagdogra, Naxalbari, Hatighisa, Moniram and Upper Bagdogra.

Phansidewa block is located between 26°26' N to 26°41' N and 88°14' to 88°24' E respectively. It has an average elevation of 98 metres above sea level having an area about 312.1 sq. km. According to census 2011 this block consists of rural areas only with seven gram panchayats, viz., Bidhannagar-I, Chathat-Bansgaon Kismat, Ghoshpukur, J alas-Nizam tara, Bidhannagar- II, Phansidewa-Bansgaon Kismat and Hetmuri-Singhjhora.

Kharibari block is located between 26°30' N to 26°39' N and 88°08' to 88°15' E respectively. This block covers 144.88 sq. km. Of these, rural area is 140.83 sq. km. and urban area is 4.05 sq. km. According to census 2011 this block consists of two census towns, viz., Shyamdhan and Kharbari and four gram panchayats, viz., Binnabari, Buraganj, Kharibari-Panisali and Raniganj-Panisali.

Map No. 2 C.D. Block wise map of the study area



Source: Prepared by the researcher

Physical set-up of the study area

Siliguri sub-division is part of an outlying hills of the lower Himalayas and a stretch of land along their base, known as Terai, a gently sloping land, partly covered with riverine deposits. The hills rise abruptly from the Terai plains and the elevation increases northward. The hilly part are fluvio-glacial deposits of the quaternary period, while most of the southern part consists of pleistocene to recent flood plain deposits. In the Terai plain due to sudden decrease in slope, rivers appear in wide and shallow beds with carrying huge loads. The several physical attributes like physiography, slope, geology, drainage, climatic characteristics, soil, and natural vegetation of this region are described here.

Physiography

The Siliguri sub-division is bounded to the north by the high hills of the Lesser Himalayas and to the south by gentle alluvium, the majority of the study area is made up of unconsolidated material derived from the Himalayas and brought down by rivers that originate from these hills. The average surface elevations along the north-south axis is 350m and 30m above mean sea level, respectively. The area's general slope runs from north-east to south-west.

The cross-sections study show that there are a number of break-in-slopes, and the variation in slopes at different heights indicates that the area is undergoing tectonic activity. The study area is divided into three micro-divisions based on slopes, contours, and cross-sections, the nature of erosion, material composition, and drainage characteristics.

a) **Structural Hills:** A comparatively tiny northern portion of the study region, which is part of the Siwaliks formation, is forming hogbacks and cuestas with high relief and a rugged profile, as well as some structurally controlled drainage. The Siwalik's height is more than 260 metres 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. The dip runs parallel to the topographical slope and faces south-west. As a result, the lower part of the hill has flat topography, while the higher part is heavily dissected by streams and rivers. The structure hills are densely forested.

b) **Piedmont Plains:** Long slopy lands from the hills to the plain, known as piedmont plains, are formed by materials from the Siwalik and the Lesser Himalayas. It covers a large portion of the study area. The piedmont plain has been divided into two sections based on contour height, slope, and constituent material composition: (i) upper piedmont plain and (ii) lower piedmont plain.

i) **Upper piedmont plain:** Upper piedmont plain: This plain is a depression in the Lesser Himalayas and is made up of a variety of boulders, cobbles, pebbles, gravels, sands, silts, and clays. From north to south, its general height ranges from 200 to 260 m.

ii) **Lower piedmont plain:** This plain is made up of unconsolidated materials such as loose sands,

gravels, silts, and clays. This plain's average elevation ranges from 120 to 200 metres, with a moderate to gentle slope to the south.

c) **Terai Plains:** Terai Plain is south of the piedmont plain and has a gentle southerly slope. The presence of a spring line, from which a number of springs originate, marks the junction of the Terai plain and the piedmont plain. This plain encompasses a large portion of the research area. The general elevation ranges from 40 to 120 metres above mean sea level. It is made up of sands, silts, clays, and some gravel and pebble beds that have been altered.

This micro-division has been further classified into two categories.

i) **Plains:** The plain is made up of alluvium deposited by the Mahananda, Balason, and Mechi rivers, as well as their tributaries. Sands, silts, and clays from rivers, with 'lenticular' deposition of gravels, make up the alluvium. There are a few prominent topographical features in this zone. The slope is generally north to south.

Physiographically this area could be divided into (a) upland plains of older alluvium and (b) low land plains of newer alluvium.

(a) **Upland plain:** The upland plains of older alluvium, which cover a large area, are not inundated during floods. It is heavily cultivated and primarily composed of sands, silts, and clays.

(b) **Low land plain:** It is situated adjacent to drainage lines and is prone to flooding during the rainy season each year, when fresh silt and loam of light colour are deposited. Following the floods, the soil becomes moist, and winter cultivation does not require any irrigation.

ii) **Terraces:** The terraces are classified according to their levels and origins. The stand over height ranges from 35 to 60 metres, and the slope is very gentle with a southerly orientation.

Terraces may be further classified into two groups- (a) River terraces and (b) Alluvial fan terraces.

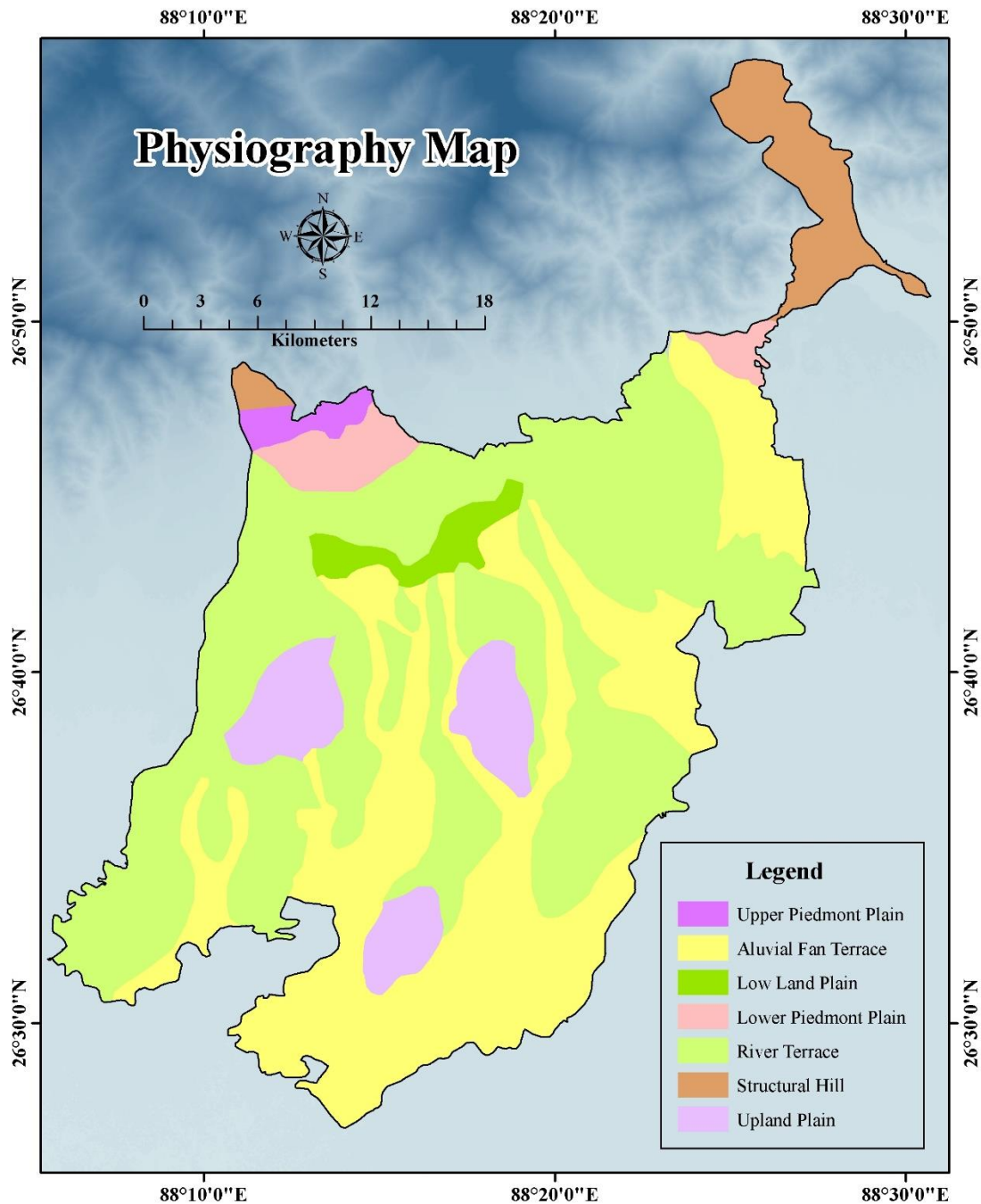
(a) **River terraces:** River terraces represent different levels of older flood or low land plains that have undergone repeated upliftment due to changes in long physical, climatic, and tectonic conditions. The Mechi and Mahananda rivers both have wide terraces. The river terraces indicate non-cyclic deposition. The Mechi river's high level river terraces are made up of rounded and sub-angular boulders mixed in a coarse matrix embedded in red clay.

(b) **Alluvial fan terraces:** Geomorphologically, due to intensive fluvial action alluvial fan terraces were developed on both sides of the rivers and also played an important role in formation and modification of landforms. Boulders and pebbles embedded in sand, silt, and clay make up the majority of alluvial fan terraces. The colours of

fan materials on river cuttings are typically black and yellow, indicating that they are clay

materials.

Map No. 3 Physiography Map of the Study Area



Source: Prepared by the researcher

Elevation

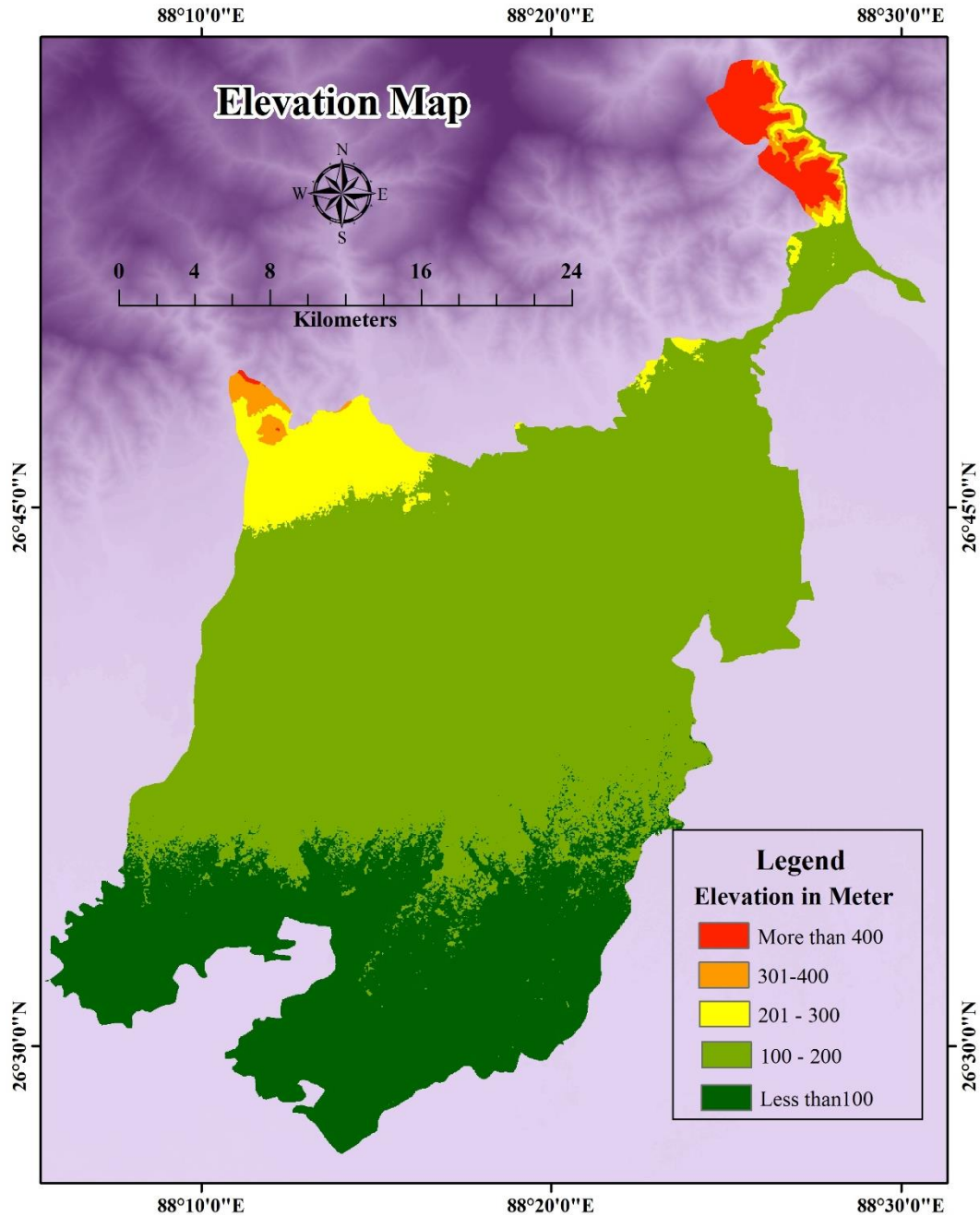
Elevation of any area is extremely important for identifying physiographic characteristics. Elevation has a direct relationship with the rate of rainfall infiltration, soil productivity, the amount of vegetation cover, and so on. According to the prepared ASTER DEM (SRTM), the sub-division lies between 48 mt. to 1299 mt. from mean sea level. The northern part of

the study region is made up of uneven hilly terrain having dense vegetation. On the contrary, the majority of the study area i.e. 72 percent, is covered by moderate to low elevation, which is primarily found in the southern and central parts, and this area is a densely populated zone with high agricultural activity and maximum built-up areas. As a result, the elevation can be classified into five categories within the

study area: Very high elevation (More than 400 mt.), High elevation (300- 400 mt.), Moderate elevation (200–300 mt.),

Low elevation (100-200 mt.), and Very low elevation (Less than 100 mt.).

Map No. 4 Elevation map of the study area



Source: Prepared by the researcher

Geological formations

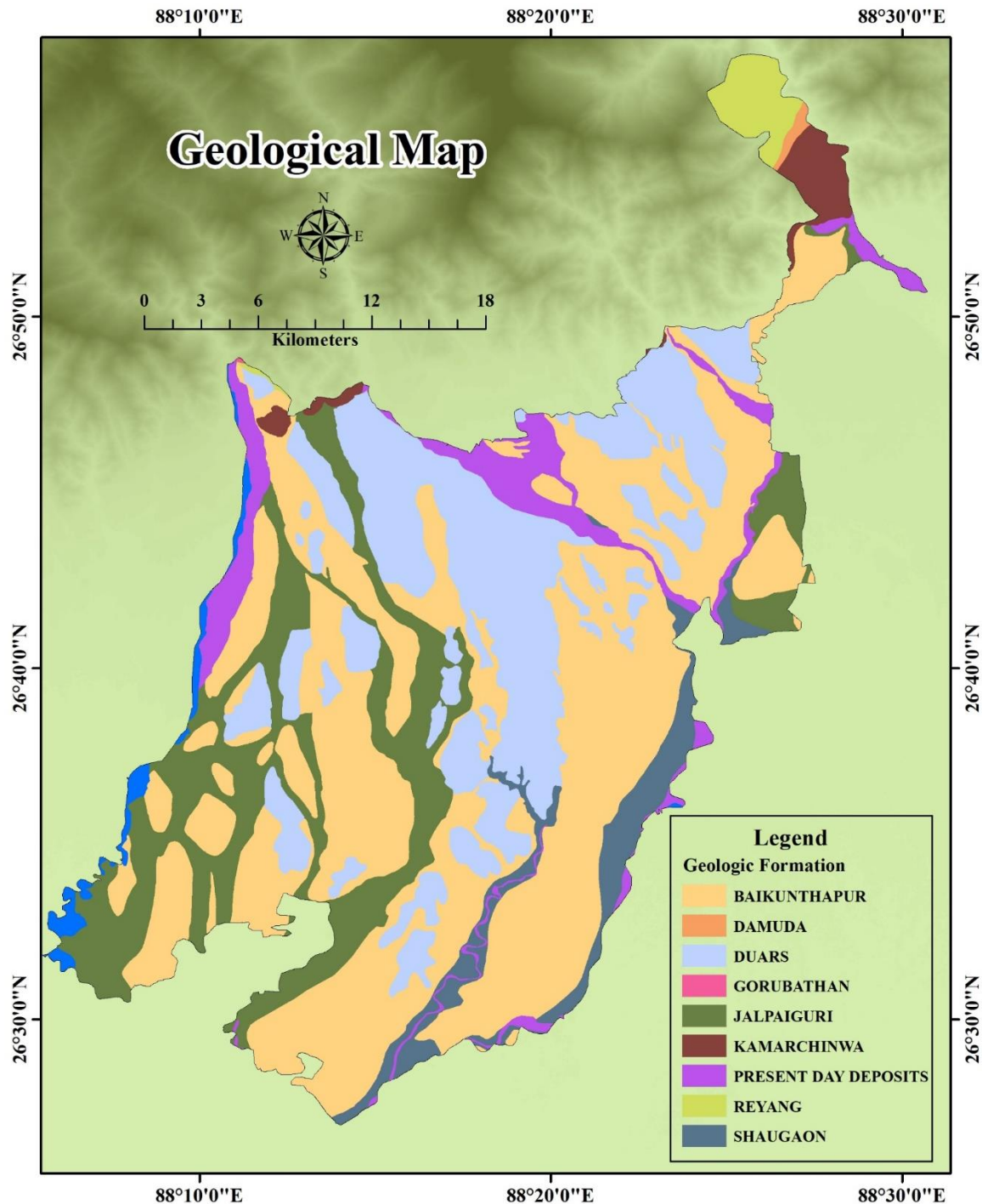
The geological formation of any area is critical because the rate of infiltration and runoff is primarily determined by the porosity of specific types of rocks. The entire region exhibits features of unusual variation, both stratigraphically and petrographically. The Siwaliks are the first group of rocks encountered while travelling north from the plains of newer alluvial deposits. They are composed of hard and highly feldspathic and slightly micaceous sandstones, quartz pebbles, and schist. A continuous belt of stratified and unstratified deposits of gravels, boulders, sands, and clay occurs along the entire base of this Siwalik zone, forming a sort of transition between the hills and the plains. The daling

intrude far inside the plains of Bengal by a series of spur and promontories, through the Siwalik. The map revealed that geologically the study area can be divided into nine major geological formations with four chronological groups. The sequential formations are Baikunthapur formation, Damuda formation, Duars Formation, Gorubathan formation, Jalpaiguri Formation, Kamarchinwa formation, Reyang Formation, Shaugaon Formation and Present day deposits. Northern tip of Matigara block that is the part of sivok hill forest covers with reyang formation, just below this damuda formation can be seen in a smaller strip. There after kamarchinwa formation can also be found in the southern portion of sivok forest. Baikunthapur and Doars formation can be found almost in

every block and this two type of formation covers more than half of the study area. The Jalpaiguri formation can be found in Siliguri Municipal Corporation region, Kharibari, along the western boundary of Phasidewa block and scatterly some part of Nakshalbari block. The present day deposits are found along the river valley of study area. Shaugaon formation can be found in the eastern portion of the Phasidewa block. However, the majority of the study area is covered by undifferentiated fluvial-glacial sediments that were deposited

during the very recent Quaternary period and spread primarily in the southern part, followed by the undifferentiated Siwalik group (Plio-Pleistocene) that mainly extends from the western to the eastern part in a linear form. Thus, it is clear that the study area has been subjected to significant tectonic activity in the geological past, as it is composed of a variety of geological structures ranging from hard crystalline gneiss to deposited alluvium.

Map No. 5 Geological map of the study area



Source: Prepared by the researcher

Drainage System

The drainage inversion of the major rivers of North Bengal, from converging drainage in the hills to divergent drainage in the plains, is one of their most distinguishing features. During the monsoon months, most of the channels, which are normally dry during the dry season, drain a large amount of water. The gradients of their long profiles have also changed significantly. The majority of the rivers are quite large. All rivers in the North Bengal plains are international in the sense that they flow through India and Bangladesh in the lower reaches and Nepal and Bhutan in the upper reaches. Most of the rivers are flowing in a braided channel. The rivers of North Bengal are divided into two systems: the Mahananda system and the Teesta system. All of the rivers originate from forested mountains and are perennial in nature. Rivers dominate the Terai's topography. The courses can be divided into three sections:

- (a) The hill section, where 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 (the outward opening of a river, of a valley, or of a strait) from the hills to the plains, where semicircular fans are formed by the deposition of boulders and coarser soil particles; and
- (c) The plains section, where semicircular fans are formed by the deposition of boulders and coarser soil particles.

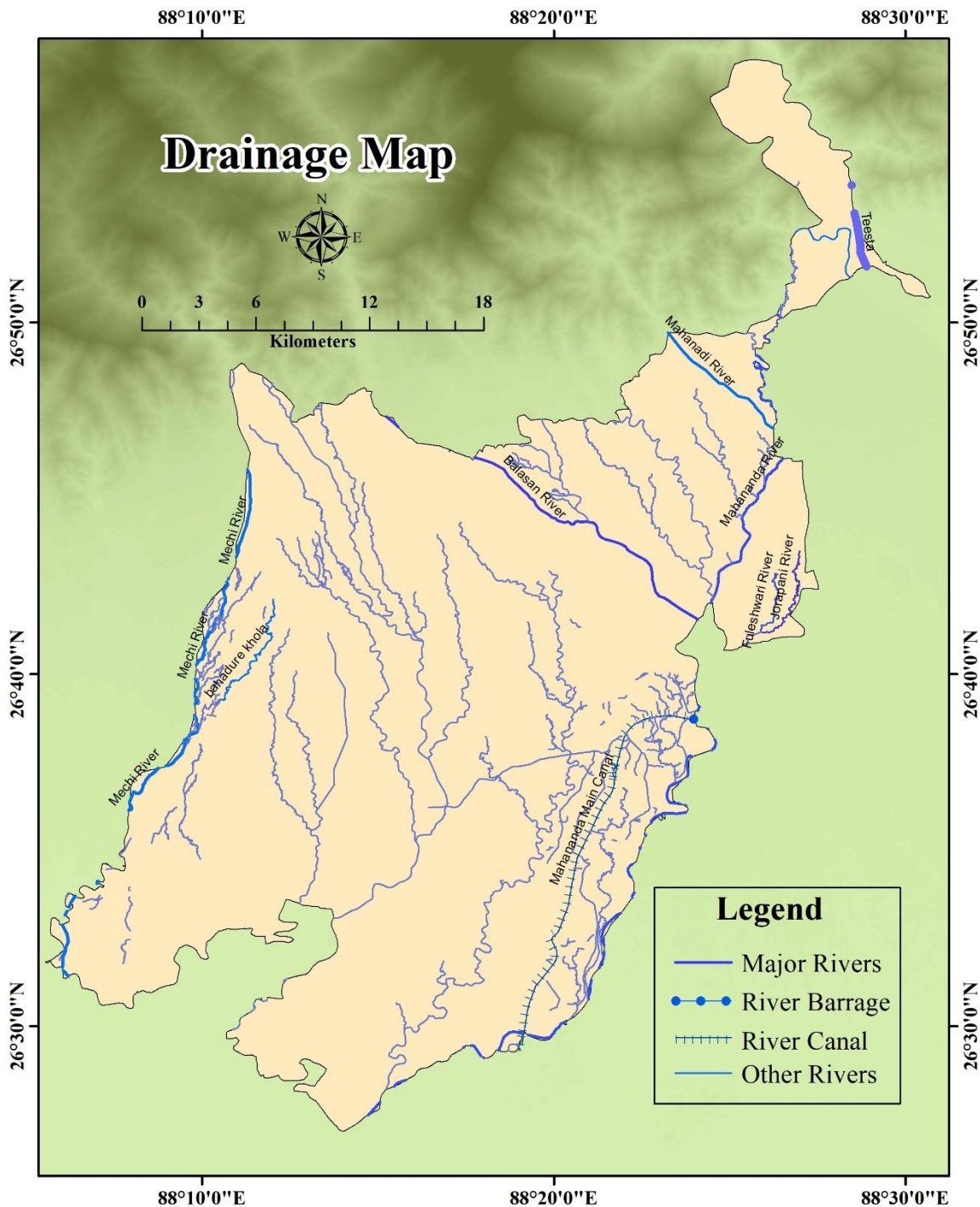
The area is mostly covered by dense jungle. The most important rivers encountered from west to east are the Mechi, which forms the border between Nepal and the Darjeeling district, the Balasan, the Mahananda, and the Teesta. The Teesta, which flows through the Terai for a short distance, receives no tributaries from this region. It empties into the Brahmaputra and the Baikunthapur jungle mahal, forming the Terai's watershed between the Ganges and the Brahmaputra. The Terai is a region in north-east India's western plains where tea is grown. Here the gardens are concentrated between the Mechi, the old Balasan and the Mahananda rivers.

- a. The Mechi River: The Mechi River, which rises at an elevation of 905m south of the west facing Rangbang spur of the Singalila range and flows through a deep gorge throughout the hilly course, forms the western boundary of the study area as well as the border between Nepal and India. It descends into the Bhabar tract, where its bed widens dramatically. The Mechi runs through the tea garden of Lohagrah. Kiyang Khola is a left bank tributary of Mechi that joins the Ashi Jhora and the Mana Jhora at an elevation of 635 metres. Floods and other tectonic activities cause it to change course several times. Although the old and new Mechi are separated by several kilometres, they both flow in the same direction.
- b. The Balasan River: The Balasan rises from the Ghum-Simana ridge's Lepchajagat Peak, flows south almost parallel to the 88°15' E meridian until it reaches the plains at an altitude of 300 m, and then turns south-east, where its valley is larger than the Mahananda's. There are two notable tributaries of river Balason, one is Rinchintong on the left bank and the other is Rangbong on the right bank. It splits into two branches as it enters the plains, one called Old Balasan and the other called New Balasan, both of which join the Mahananda just below Siliguri. In the mountain's foothills, there are numerous terraces. The amount of water flowing through the new channel is significant. The river has numerous tributaries. Pulungdang Khola, Rangbang Nala, Manjwa Jhora, Dudhia Jhora, and the Chenga are just a few examples.
- c. The Mahananda River: The Mahananda River, which originates at Paglajhora Falls of Mahaldiram hills, east of Kurseong from an elevation 2103.12 m, forms the study area's eastern boundary. During the monsoon, the catchment area receives a lot of rain. After debouching the hills, the Mahananda flows south until it reaches Siliguri, where it turns south-west. Finally, the river empties into the Ganges. There are several tributaries, including the Trinai, Ronchandi, and Dauk.

Table No. 1 Rivers and their tributaries in study area

Watershed	Sub-Watershed	Flow Regime	Rivers & Tributaries
Brahmaputra	Teesta	Middle	Teesta
Ganga	Mahananda	Upper	Mahananda, Balason, Mechi
Source: Cajee L,2018			

Map No. 6 Drainage map of the study area



Source: Prepared by the researcher

Climatic characteristics

Darjeeling district has two different climatic conditions due to its distinctive topographical features having hills in a larger portion of the district and plain lands of Terai towards south and south-eastern part. The marshy tract of Terai is humid and warm, showing typical tropical and sub-tropical climatic conditions depending upon the elevation.

- a. Rainfall: The Darjeeling Himalayan region's rainfall pattern is influenced by the south-west monsoon, and it receives high annual rainfall with frequent heavy rains, primarily between June and September (monsoon period). The southern front of the

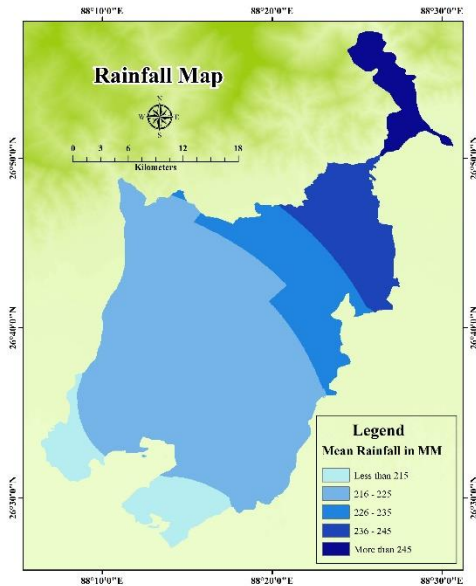
Darjeeling Himalaya acts as a first orographic shield for south-west monsoon winds that arrive from the Bay of Bengal towards Himalaya during the monsoon season, resulting in the highest rainfall intensity (Prokop and Walanus 2017). However, the study region's annual mean rainfall is around 2203 mm.

- b. Temperature: The mean minimum and maximum temperatures are 13.8 °C and 28.6°C, respectively. The maximum temperature is usually reached during monsoon and the lowest temperature is reached during the cold winter, between December to March, depending on elevation.

The rainfall map and temperature maps for the research area have been created using the Inverse Distance Weighted Interpolation Method (IDW) in ArcGIS 10.3 software. The study region has been classified into five rainfall zone. These ranges from 200 mm to 300 mm. Almost half of the study area falls under two rainfall zones i.e. 216 to 225 mm and <215 mm. The high rainfall zone i.e. >245 mm can be found in northern part of Matigara block.

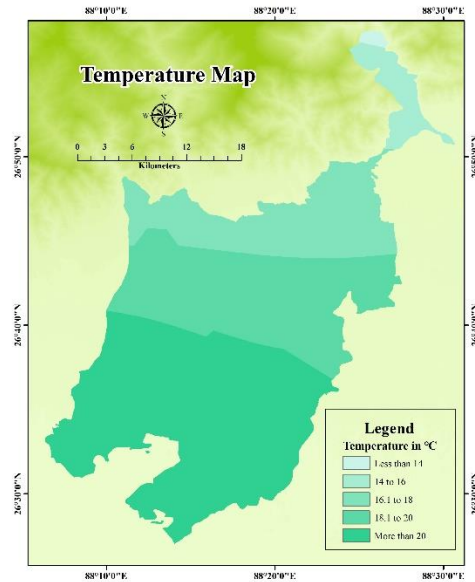
On the other hand, the study area has been classified into 5 temperature zones, i.e. <14°C, 14° to 16°C, 16.1° to 18°C, 18.1° to 20°C and >22°C. The southern part of the study area consists of two blocks viz. Kharibari and Phansidewa falls under the highest temperature category i.e. >22°C. The second highest temperature zone i.e. 18.1°C to 20°C is found in the central part of the study area. Rest of the temperature categories are found in the northern part of the study area.

Map No. 7 Rainfall map of the study area



Source: Prepared by the researcher

Map No.8 Temperature map of the study area



Source: Prepared by the researcher

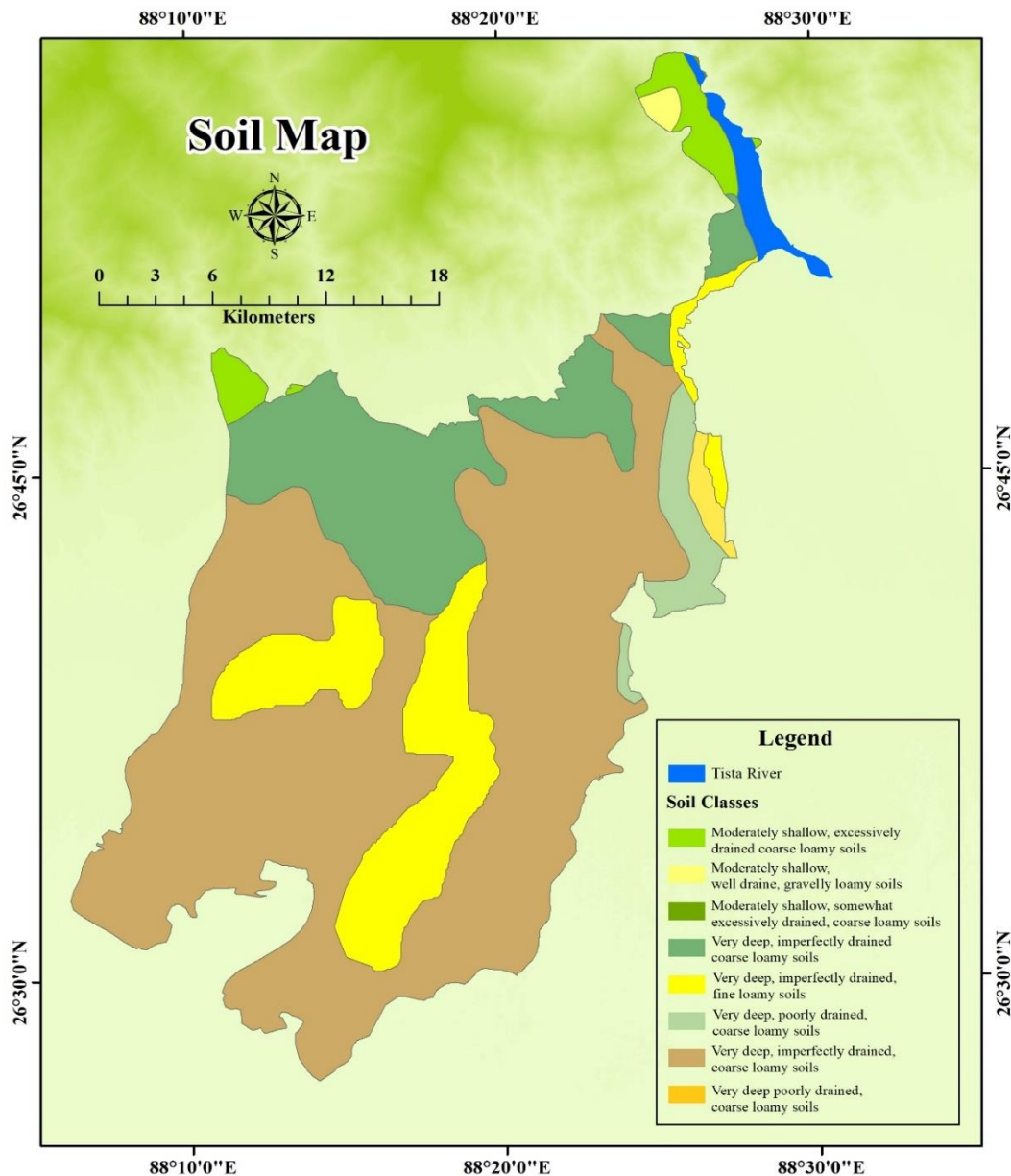
Soil

Soils typically have a strong correlation with an area's physiographic condition. The small northern part of the study area is dominated by soils originated from the underlying geological structure. On the contrary, the entire southern part of the area is controlled by the soil developed by both fluvial action and lithological process. Both of the process ultimately controlled the structure, texture and other properties of soil.

According to National Bureau of Soil Survey (NBSS) and Land Use Planning (LUP), the study area can be classified into 8 categories with respect to soil types. The northern tip of the Matigara block and north-western tip of Naxalbari block is covered with moderately shallow, excessively drained coarse loamy soil. On steep side slopes there is gravelly loamy surface soil. Very deep imperfectly drained coarse loamy soil

occur on piedmont plains with loamy surface has been found in the central and northern part of Naxalbari block and few patches in the northern part of Matigara block. More than half of the study area has been covered with very deep imperfectly drained coarse loamy soil occurring on level to nearly level piedmont plain with loamy surface. Few patches of very deep imperfectly drained coarse loamy soil occur on very gently sloping lower piedmont plain has been found in central part stretching towards the southern part of the study area and a small portion in eastern part. Along the eastern boundary of Matigara block a very deep poorly drained coarse loamy soils has been found. Moderately shallow well drained gravelly loamy soil occur on the steep side slopes with gravelly loamy surface has been found along the eastern part of Siliguri Municipal Corporation.

Map No. 9 Soil map of the study area



Source: Prepared by Researcher

Natural Vegetation

Vegetation is primarily influenced by climate and soil in a given location. There is a dense cover of vegetation in the study area, which is highly associated with the form of slopes. The area is characterized by steep slopes on the north and north-western sides. The natural forests of study area may be grouped into following broad categories:

- a) Tropical semi-evergreen forest: These type of forests are restricted to foothills. The important species are michelia champaca, terminalia myriocarpa, ailanthus grandis and phoebe species. All these species yield valuable commercial timbers.
- b) Tropical moist deciduous forest: Moist deciduous forests have shorea robusta as important species. Among its associates, the species like michelia champaca, schima wallichii and chukrassia velutina which are interspersed with riverain forests of acacia catechu, dalbergia sissoo and bombax ceiba, exist.

- c) Sub-tropical hill forest: These forests occur upto an elevation of 1.824 m (refer under sub-tropical broad-leaved hill forests by Champion and Seth, 1968). The common species are betula cylindrostachys, anus nepalensis, schima wallichii and engelhardtia spectata etc.

Manmade Forests: The valuable indigenous species form the main component of the plantations in the district. An exotic conifer, cryptomeria japonica, has done exceedingly well in the hilly tracts of this area. Other exotic conifers like pinus petula, cupressus species etc. have also shown great promise in the region

There are several reserved or protected forest in this area namely Bagdogra Range, Panighata Range, Mahananda Wild Life Forest. In addition, many open forest areas can be found here, especially to the south of the study area. (An area recorded as forest but not included in Reserved or Protected forest category. Ownership status of such forests varies from state to state.)

The main factors for dense vegetation in the terai region is low land with gentle slopes and excellent soil fertility. The vast bamboo bushes cover the majority of the land. Twenty to thirty fern species can also be found on the lower and upper terraces of hilly patches. The plains of the study region are densely covered with weeds and grasses.

Conclusion

Therefore, the study area of Siliguri Municipal Corporation and 4 C.D blocks of Siliguri sub-division viz. Matigara, Naxalbari, Kharibari and Phansidewa have a total area of 819.61 sq. km. According to the census 2011, the total population of the study area is 1189838 persons consisting of 65417 urban population and 535221 rural population. J.D. Hooller first used the term 'siligoree' in 1867. Siliguri was declared a sub-division head quarter under Darjeeling district for the first time in 1907. Initially Siliguri developed rather sporadically. After the First World War in 1919, modern motorised transportation system was introduced in Siliguri to transport people from Siliguri to Darjeeling and back. Public bus was introduced in Siliguri in the year 1925, commuting people from Siliguri to Naxalbari and back. Gradually the population of Siliguri reached 7000 in 1931 and for the first time it was recognized as a census town. During the period of partition and social unrest, the population of Siliguri increased rapidly due to influx of huge number of refugees from East Pakistan.

Siliguri got the status of a municipality in 1949 after independence. After the Chinese invasion in 1962, the roads in and around Siliguri was developed rapidly for strategic purpose. Gradually a large number of military, air force and army bases were established in and around Siliguri making this town a very important cotterpin in Indian defence system. With

the development of NJP railway station in 1964 on the outskirts of the city, Siliguri emerged as a railway transportation hub connecting north-east India with the mainland. The construction of Farakka Barrage in 1974 led to uninterrupted rail and road connectivity between Siliguri and South Bengal making people's movement more convenient resulting in further growth of Siliguri. After the creation of Bangladesh in 1971, another wave of refugees came to Siliguri resulting in rapid increase in population. Finally, in 1994, Siliguri got the status of a Municipal Corporation.

In terms of physiography, the study area is part of an outlying hills of the lower Himalayas and a stretch of land along the base known as terai. The elevation of the study area ranges from 48 m to 1299 m above the mean sea level. Major rivers flowing through the study area are Teesta, Mahananda, Balasan and Mechi. The annual average rainfall in the study area is above 2000 mm with mean maximum and minimum temperature lying between 13.8° C to 28.6° C. Forests are abundant in the study area with a number of reserved and protected one.

Agriculture in the study area is of diverse nature with crops like paddy, jute, potato and various vegetables cultivated in abundance. Tea plantation is very common in the study area and the economy of the region depends a lot on the processing of the tea leaves. Siliguri is essentially an urban centre which has flourished with the passage of time due to development in trade and commerce. It is the main distribution hub of industrial and household goods moving to the neighbouring state of Sikkim, Darjeeling hills, North-East India, Nepal and Bhutan. Tourism is well developed in North Bengal and Siliguri acts as the gateway to different tourist spots located in Sikkim, Darjeeling and the forests of North Bengal.

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