CHAPTER III
GEOGRAPHICAL BACKGROUND

3.1. PHYSICAL SETTING

Meghalaya, being one of the constituent states of north­eastern region of India, besides sharing the region's general characters, also maintains a distinctive character in its various physical features like geology, physiography, drainage, climate, soil and natural vegetation. The total geographical area of the state is 22,489 sq. Km. and it is located between 25 ø 05’N - 26 41’N and 89 47’E - 92 30’E. The state comprises five districts of the Jaintia Hills, the East Khasi Hills, the West Khasi Hills, the East Garo Hills and the West Garo Hills. However, these politico-administrative units can be regrouped into two broad regions considering their physical and socio-cultural characters. These are the Khasi and Jaintia Hills region and the Garo Hills region. The physical characteristics of these two regions have been discussed in detail in the present chapter. Since the present study focuses mainly on the urban Khasi group of population, a separate treatment is also made on the physical characteristics of Shillong urban area which is the most important area of concentration of urban Khasis in Meghalaya.

3.1.1.(a) Geology

Geologically, Meghalaya Plateau belongs to the part of Super Continent of Gondwanaland, i.e., the Peninsular table land, but is detached from the latter by the intervening spread of the
alluvium of the Ganga and the Brahmaputra. The structural history of the region reveals several phases of erosion, sedimentation, diastrophism, intrusion, movements of land and sea, and emission (Singh, 1968). The plateau is mainly made up of rocks of the pre-Cambrian age. The pre-Tertiary and Tertiary rocks occur above these rocks on its western and southern margins. Stratigraphically the rocks of the plateau belong to five broad geological formations, namely the Archaean gneissic complex, the Shillong group of rocks, the lower Gondwana, the Sylhet traps, and Cretaceous - Tertiary - Quarternary Sediment. (Map no. 3.1). The Archaean-gneissic complex occupies the central and northern parts of Meghalaya Plateau. The rocks include gneiss, granite, quartzites, schists, etc. The Shillong group of rocks lying unconformably over the gneissic complex, occurs in the central and eastern parts of the plateau. These include phylite, quartzites, schists and conglomerates.

The lower Gondwana rocks are found in the western part of Garo Hills which include pebble beds, sandstones and shale. The Sylhet trap is exposed along the southern border of the Khasi Hills in an east-west direction, and rests unconformably over the eroded pre-Cambrian basement rocks. These rocks are predominantly basalt, rhyolite and acid tuffs.

The Cretaceous-Tertiary-Quarternary sediments occupying extensively the southern part of the plateau are considered to be the continuation of the Cretaceous-Tertiary sediments of Bengal plains. This group has three sub-divisions: (a) the Khasi group, (b) the Jaintia group and (c) the Garo group.
MEGHALAYA
GEOLOGY

BOUNDARY:
INTERNATIONAL
STATE

MAP No. - 3.1
LOWE R CRETACEOUS
UPPER PROTEROZOIC
MIDDLE PROTEROZOIC
ARCHAEOAN-MIDDLE PROTEROZOIC

Alluvium
RECENT
Khasi Group, Axial Group
UPPER CRETACEOUS

Dihing Series, Duptilia
PLEISTOCENE
Sylhet Traps
LOWER CRETACEOUS

Surma Series & Baghmara
PLEISTOCENE
Granites
UPPER PROTEROZOIC

Formation (Garo Hills)
MIocene
Shillong Group
MIDDLE PROTEROZOIC

Tipam Series & Chengapara
OLIGOCENE
Grniss with old inliers,
Archaean-Middle Proterozoic

Formation (Garo Hills)

Barail Series & Simsang
OLIGOCENE
Sela Group in Arunachal Pradesh

Formation (Garo Hills)

Jaintia Series, Disang Series
EOCENE
Faults, Thrusts

Map No. - 3.1
The Quarternary deposits on the plateau occur in older and newer alluvium. There are isolated patches of older alluvium along the southern fringe of the Khasi Hills, whereas newer alluviums are formed in the river valleys of the southern foothills of the Garo and Khasi Hills and along the western border of the Garo Hills. An analysis of geological structure and formation in Meghalaya reveals a broad regional difference between the western Garo Hills districts and the eastern Khasi-Jaintia Hills districts.

The Garo Hills region of the State, in its greater portion, is formed of gneissic rocks overlaid by sandstones and conglomerates of Cretaceous-Tertiary system. The sediments of this system of rocks are known as the Garo group in the region. This group of rocks is again divided into the Simsang, Baghmara and the Chengapara formations. The Simsang is the oldest formation in the Garo group which lies conformably over the Kopili series (the youngest formation of the Jaintia group of Cretaceous - Tertiary sediments), and consists of siltstone and sandstone. The Baghmara formation includes sand, pebble, conglomerates and clay which lie conformably over the Simsang formation. The Chengapara formation consists of sand, siltstone and clay. On the top of these Cretaceous-Tertiary formations rests limestone of Numulitic age, while sandstones of upper

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1. "Garo Hills", The Imperial Gazetteer of India, Vol. XII (New Edition), New Delhi, p. 172
Tertiary origin form low hills along the Mymensing border.

The Khasi-Jaintia Hills region on the Shillong plateau proper is made up of gneissic rocks which are bare on the northern borders but on the central region is covered by submetamorphic rocks. This gneissic basement structure is apparently covered by much younger sedimentary formations like epidiorites, amphibolites, etc., together known as Khasi Greenstones (Bandopadhyay, 1972). These rocks are highly metamorphosed. The metamorphic rocks along with the quartzites of Shillong series are very much resistant to weathering and erosion and form most prominent geomorphological features in the area. Intrusions in later age within the Shillong series form rocks known as the Mylliem Graites (Krishnan, 1982), which cover a wide area to the South of Shillong. After the Shillong series, the next significant sedimentations in the Khasi-Jaintia region were the Cretaceous-Tertiary rocks which are known as the Khasi group (older) and the Jaintia group (younger).

The Khasi group of rock is again divided into the Jadukata formations - the Bottom Conglomerate and the Mahadek formations. These three types of rocks lie conformably one over the other with the Jadukata formations at the base. The Jaintia group. which is a younger formation than the Khasi group consists of three layers again. These starting from the oldest, are the Langpar, the Sheila and the Kopili formations. These sedimentary

2. "Khasi and Jaintia Hills. The Imperial Gazetteer of India,,Vol . XV, New Delhi, p.255
formations contain chiefly limestones, conglomerates, shales, sandstones and calcareous sandstones. These Cretaceous formations are further overlain by Numulitic strata which contain deposits of coal and lime.

Geological formations of the Meghalaya Plateau, as can be seen in the later chapters of the study, play a considerable role in determining the settlement sites of the people in the region. The natural instinct of man is to avoid the rugged areas as far as possible for habitation. But again, availability of certain rocks and minerals governed by the geological structure of a particular place encourages man to settle down in such places overlooking other physical and cultural constraints. Such instances are not very uncommon in Meghalaya.

3.1.1. (b) Physiography:

Geomorphologically, the Meghalaya Plateau is an westward extension of the massive block of peninsular India lying to the east of the great Rajsahi - Malda gap (Chaterjee, 1973). The orogenic movement in this part of the country was quite slow and almost absolutely free from folding and warping which resulted in the formation of horizontal beds of sedimentary rocks. These horizontally laid sedimentary rocks are responsible for the platform like structure of the area. Physiographically, however, two regions with certain separate identity can be recognised in the State, viz., the highly dissected western part of the Garo Hills and the true plateau sector of the Khasi-Jaintia Hills in the centre and the east. (Map 3.2).
MEGHALAYA
PHYSIOGRAPHY

GENERALISED RELIEF

1350 (m)
900
600
300
150
0

BOUNDARIES:
INTERNATIONAL
STATE

MILES
10 0 10 20 30 40 KMS

KMS
0 10 20 30
The western dissected hilly tract of the Garo Hills covers an area of 8180 sq. km. and has an average elevation of less than 600m. (Map 3.2). This section forms the western extremity of the region. The hills here rise abruptly from the plain on the south (the Surma plain) and attain their highest elevation in Tura and Arbera ranges, which lie parallel to each other, near the centre of the district. Tura range and Simsang valley are the two most important physiographic units of this region. Tura range, extending for a distance of 50 kms. from Tura town to Siju, contains the highest peaks of the Garo Hills like Norkek (1412m), Megonggiri (1283m), Meiminram (1196m) and Gogangdara (1011m). Tura range is a typical horst bounded by two fault lines. Along the northern fault line flows the Simsang River eastwards for about 45 kms. before turning south through a deep valley, and ultimately coming down to the plains near Baghmara. The rest of the Garo hills consist of tumbled mass of hills, having a north-south alignment with altitudes ranging between 450m. and 600m. At the foot of these hills, there is a fringe of level land into which outlying spurs project.

The central and eastern part of Meghalaya, i.e., the Khasi and Jaintia Hills region together covers an area of 14,375 km². While on the north, this region rises gradually from the plain of the Brahmaputra in a succession of low ranges, on the south the same springs up abruptly from the plain of Bangladesh to a height of 1219m. and poses like a steep wall along the north of the Surma Valley (Map 3.2). The Jaintia hill section on the east has, however, a gentle slope. This region has again three
physiographic units: the northern hills, the central plateau and the southern hills (Map 3.2). The northern section of the Khasi-Jaintia Hills is an area of low undulating hills gradually sloping down towards the Brahmaputra valley. This is the sub-mountain region of Meghalaya locally known as the 'Bhoi' country. These hills include two distinct peneplain surfaces within themselves, and they are separated from the central upland by a fault line.

The Central section, running east-west, consists of the plateau proper and is referred to as 'Ri-Khasi' and 'Ri-Jaintia' regions by the Khasi and Jaintia people in their respective domains. The outer limit of this section is roughly defined by 1500m. contour, and contains remnants of several peneplain surfaces varying in elevations from 1500m. to 2300m., preserving traces of a few erosional cycles. The Shillong hill is the highest of all these peneplain surfaces. This section of the region reflects a youthful topography compared to other sections, which may, perhaps be the result of a recent uplift. Rolling knolls and gentle slopes are also noticed here with several high peaks as the Shillong peak and the Laitkor peak.

The southern face of the plateau is the steepest which is locally known as the 'War' country. The northern part of this region is made up of Mylliem Granite, and has rounded hills and shallow valleys, while further south, it is a great structural platform. Fluvial erosion has produced several partially detached stations on this platform as Cherrapunji, Lyngkyrdam, Mawsynram, etc. From Cherrapunji, downward, gentle slope is
observed for a distance of about 7 kms. and then there is rapid fall of the plateau to the Sylhet plain giving rise to deep precipices in places indulging in heavy rainfall. The physiographic characteristics in the region described in the foregoing paragraphs are reflected greatly in the distribution and concentration pattern of population and the growth of settlement units. Physiography plays both the permissive and restrictive roles in the building up of human settlements. Judging from this point of view, it is apparently observed that in Meghalaya plateau people tend to cluster on relatively flat plateau surfaces of the central part avoiding as far as possible the steep slopes (e.g., the War country in the south) and the fringe areas (e.g., the Bhoi country in the north). The later two regions are unsuitable for human habitation as they are located in areas of steep slopes and unhealthy climatic conditions respectively. Physiography in the plateau has not only affected distribution of population but also, to a considerable extent, has affected the socio-economic development of the people. It is primarily the physical conditions of the region which keep people in this part of the country, who are principally tribals, both socio-culturally and economically isolated from the neighbouring plains people of the Brahmaputra valley. Geophysical conditions have also left impression on the process and pattern of early as well as recent immigration into the region. All these aspects have been dealt with, giving due weight to them, in the subsequent chapters.
3.1.1. (c) Drainage:

Meghalaya, with a humid tropical climate in general, and with chemical weathering as its dominant process of rock or surface weathering, indicates that the drainage lines are the most important elements of surface geodynamics. With an average annual precipitation of 26,889 mm, Meghalaya is drained by number of consequent and subsequent streams along with their tributaries of different orders. All these streams together display a rectilinear drainage arrangement. The rivers and streams having north-east to south-west, south-east to south-west and east to west directions appear to represent faults and master joints and fractures and this entire network is a result of upliftment of the plateau that has taken place in the recent past. (Map 3.3).

In the western part of the State, i.e., in the Garo Hills region, two types of drainages exist, the north flowing rivers falling into the Brahmaputra and the South flowing rivers draining into the plains of Bangladesh (Sylhet). These two systems are differentiated by the central watershed of the Tura range. Someswari of the southern system, is the most important stream here, which later joins with the Kangsa river of Mymensingh. The other notable south flowing streams are Bhugai, Nitai and Maheshkhali. These rivers are significant as their channels are used for floating timbers during the rainy season. In the northern system, the main streams are Dudhnai, Krishnai.

3. "Garo Hills". The Imperial Gazetteer of India, p. 172
Jinjiram, etc. all discharging into the Brahmaputra. There is hardly any bill or lake in the Garo hills excepting a marsh area near Phulbari.

The drainage system of the eastern part, i.e., the Khasi-Jaintia Hills region is to a great extent directed by the central upland zone which acts as the major water divide between the south-flowing and north flowing systems of streams. On the north, the rivers flow down to join the Brahmaputra and its tributaries. Principal among them are the Kopili, the Umkher (called 'Barapani' on the plains), the Umium, the Umtreu with its major tributary the Umran (known as 'Digaru' in the plains) and the Umkhri (Panda, 1983). The principal south-flowing streams are the Kynsiang (known as 'Jadukata' in the plains), the Mawpa, the Umiew or the Umiam (known as 'Bogapani' in the plains), the Wah-Sorynkiew, the Myntdu (called Hari in Bangladesh) and the Mynger. The south-flowing streams fall into the Sylhet plains of Bangladesh.

The northern rivers of the Khasi-Jaintia region show a characteristic feature of plain embayment which they form at their entrance into the plains, making the northern boundary of the plateau fairly irregularly arranged in its topography. The southern streams, on the other hand, enter the plains of Bangladesh in deep gorges made up of faulted face of the southern boundary of the plateau. Thus the streams falling down from these surfaces produce waterfalls at varying heights between 14m to above 400m. The Mawsmai, for example, is one such magnificent falls at an elevation of 348m, on the southern fringe
of Cherrapunji. Some such cascades also abound the neighbourhood of Shillong town.

The Southern streams become navigable only when they enter or nearly enter the plains of Bangladesh. Thus, for the major part of the their course within Meghalaya they have quite insignificant contribution from human point of view. the torrential nature and steep slopes of their valleys together restrict the distribution and growth of settlement of people to a considerable extent. the northern streams, on the other hand forming embayments in the foothill region, also make the region unsuitable for cultivation and settlement. Thus, people in the Plateau obviously tend to cluster on the central upland zone and in various sheltered valleys in the lower elevations, leaving or avoiding as far as possible the northern and southern extremities.

3.1.1. (d) Climate:

The State of Meghalaya, as a whole, following the general pattern of climate of the rest of country, has a tropical monsoon type of climate. This general pattern is, however, modified in places of high elevation, where a temperate effect is usually found, especially in the patterns of distribution of annual atmospheric temperature. Another character of climate is its orographic position facing the onshore rain-bearing south-west monsoon winds. these winds strike against the steep slope of the plateau at first before moving out across it and thus make the region wettest not only in India but also in the world (Map 3.4.a and 3.4.b). Two stations, Cherrapunji and Mawasynram being
situated on the southern face of the plateau, therefore, receive as high as an average annual rainfall of 114,000 mm. and 125,000 mm. respectively. (Map 3.4). However, the region being influenced by the south-west and north-east monsoons, has a seasonal rhythm that is common for the country as a whole. Climatic year has four characteristic seasons in the plateau: (i) the cold weather season (late November to March); (ii) the hot weather season (April to early or middle June); (iii) the rainy or the 'monsoon' season (mid June to September); (iv) the season of retreating monsoon (October to early November).

(i) The Cold weather season begins from the middle or later part of November and continues till the end of March or in some places to the early part of April. The beginning of the season is marked by a steady decrease in temperature till it reaches its minimum in January. There are of course variations in the mean monthly temperatures in the areas from east to west (Map 3.4.a). Thus, places like Shillong and Jowai, have a fall in the mean monthly temperature from 13°C in November to 9°C in January, but in Cherrapunji and similar places of low altitude the fall is recorded from 15°C in November to 10°C in January. Again, towards west, as in Tura, in places of low altitudes the fall is from 21°C in November to 17°C in January. It therefore, appears that, the distribution of atmospheric temperature in the State, besides being affected by any other factor, is a direct outcome of altitude of a place.

The diurnal variation of temperature in the season is also quite marked. In the central and eastern sections of the Khali-

- LOCATION OF THE METEOROLOGICAL STATION.

Map No. - 34 (a)
Jaintia Hills, the diurnal range is as high as 10 °C – 12 °C. While during the day the temperature may rise up to 18 °C, but falls almost down to 4 – 5 °C during the night. The nights become quite chilled and morning frost remains a common phenomenon. In the Garo Hills region of the west, the diurnal range, though quite high (10 °C), the days and nights are much warmer than that in the central and eastern regions. The mean seasonal temperature in this season also differs from one place to other. While in the Khasi-Jaintia Hills the mean winter temperature is 6 – 8 °C. in the Garo Hills it is 15 – 17 °C. Relative humidity also decreases from November to January. Rainfall is almost nil, occurring only occasionally during the early part of the season. January is the driest month in the season as well as in the year.

(ii) The hot weather season commences from early or mid-April and continues to middle or late June. It is actually a transitional phase of climate between the winter and rainy seasons. The season is characterised by a gradual increase in surface temperature, which becomes maximum in early June. In the Khasi-Jaintia region, particularly in the central uplands, the rise of temperature is quite moderate (24 °C in June), but in the Garo hills it is much higher (33 °C in June). The range is of course lower varying between 7 – 8 °C in different places. Relative humidity begins to increase in this season recording about 90 per cent in the Garo Hills and 70-75 per cent in the Khasi-Jaintia Hills. There are occasional rains in the beginning of the season but towards the later part of mid and late June rainy days become more frequent.
MEGHALAYA
NORMAL MONTHLY AND ANNUAL RAINFALL

BOUNDARIES:
INTERNATIONAL
STATE

ANNUAL RAINFALL IN MILLIMETRES


LOCATION OF THE METEOROLOGICAL STATION

Map No. - 3.4 (b)
The rainy season of south-west summer monsoon has its "burst" in Meghalaya in the middle of June and then continues up to the end of September and in some places till the beginning of October. The east-west alignment of the plateau across the path of the south-west monsoon and the abrupt steepness of the southern slope of the plateau play a significant role in the distribution of rainfall in various parts of the plateau. It is in this part of the country that the monsoon winds blowing with a speed varying from 20 kins. - 60 kms. per hour reach the southern foothills and then are forced up through the gorges to the platform of different elevations. In the process of upliftment the succeeding waves of wind currents pass over the upland to the north and cause rainfall to the interior areas. There is a considerable variation in the amount of rain recorded at different rain gauge stations in the State. Cherrapunji-Mawsynram area records about 13,400 mm annually, while Shillong being only 50 kms. north receives only 2296 mm annually. This is because of the rainshadow effect between the southern and northern slopes. Jowai receives a somewhat greater amount of rain than Shillong (3077 mm). Toward west, Tura receives 3360 mm., but Mehendraganj being situated at the south-western corner receives about 1600 mm. Dalu to its east receives about 2850 mm, while Damra at the northern border gets about 2800 mm annually.

There is an appreciable decrease in seasonal temperature during the rainy months in the Khasi-Jaintia section and more so in the central uplands. But in the Garo Hills, the mean seasonal temperature does not show any considerable decrease and ranges
between 28°C and 32°C. Relative humidity increases from 68 percent in April to 81 percent in June, July and August in the interior areas of Khasi and Jaintia Hills, and 90 percent in Cherrapunji-Mawsynram area. In the Garo Hills, it increases from 75 percent in May to 90 percent in June, July and August.

(iv) the season of retreating monsoon, which is again a transitional phase between the rains and winter, lasts in the plateau from the beginning of October to early or mid November. Towards the end of September, the intensity of rain decreases and also the number of rainy days becomes scanty more and more, until it becomes very few in the early October. There is some decrease in temperature and relative humidity in this month. The sky often remains clear and the nights start becoming colder. The diurnal range of temperature also shows a gradual increase.

In the central upland region, winter conditions set in by middle of October, whereas the eastern (Jaintia) and western (Garo) sections remain much warmer till the beginning of November.

The climatic characteristics along with its seasonal variations are significant from the viewpoint of agricultural practices for a region like Meghalaya, where people primarily depend on agricultural economy for his livelihood. Here in this part of the country certain elements of climate like rainfall and humidity play a crucial role in deciding sites for administrative and business centres from the very early days.

3.1.1. (e) The Soil:

The climate, rock structure, slope and relief within the
State differs from place to place and thereby brings heterogeneity in the composition and character of soil in the region. Broadly, the soils of Meghalaya are of three types, Red loam or Hills soils, the Lateritic soils, and new and old alluviums.

The red loamy soils are found all along the foot hills and sub-mountain fringes of the region. But, these soils are predominant in central upland of Khasi-Jaintia Hills, where the soil is mostly sandy because of the sandstone outcrops, whereas in parts of Ri-Jaintia area the soil tends to be silty.

They are also rich in organic matter which again tends to be more in higher altitudes because of low temperature. The soils on the central upland region have high moisture content. Though the humus content is high, it is devoid of base minerals like calcium, potassium, sodium, etc., except being rich in iron oxides. Towards the western part of the central uplands, hill soils are gradually replaced by lateritic soils. These hill soils being acidic in nature, have their significance in being suitable for the cultivation of fruits and potatoes and in areas of hill slopes and terraces for the cultivation of rice.

The southern War Country is practically devoid of any soil cover because of excessive rain. The sandstones being disintegrated constantly by rain make the soil, if there is any, extremely sandy. Towards the lower part, where the slope becomes gentler, soil tends to be slightly silty to clay. Further down, near the border of Bangladesh, lateritic soils occur in small
fringes. These soils are highly leached, poor in plant nutrition and acidic in reaction, and thus they do not hold a favourable base for agricultural purposes.

Along the northern face of the central upland (Bhoi Country) lateritic soil is found. These soils varying from sandy to silty loam (especially on flat river valleys) are very much acidic in character and are highly leached. Because of extensive Jhum cultivation practised here, the area does not contain any thick and tall forest.

In the western section of the Garo Hills regions for major part of surface area, the soil cover is lateritic, varying in nature from loam to silty loam (on the river banks and flood- plains). Further west, nearer to the border, lateritic soil occurs on the high ground, but the plains have silty loam to older alluvium. Along the border areas, the soil is predominantly alluvial being both older and younger. The lateritic soils become workable only after rains and by heavy application of organic matter which may increase the fertility of the soil. The alluvial soils, on the other hand, have a wider use by human being, since this type of soil is suitable for cultivation of rice, fruits and vegetables.

3.1.1. (f) The Natural Vegetation

In Meghalaya, though the area under forest is quite low, vegetation is extremely varied and interesting from botanical point of view. The natural vegetation on the whole is of three principal types, namely, coniferous, evergreen mixed forest and
grasslands. There is, however, a wide regional variation between the western (Garo), central (Khasi) and eastern (Jaintia) sections of the plateau.

The vegetation of the Khasi-Jaintia Hills in its central upland portion is characteristic of temperate zone. At elevations of 900-1000m indigenous pines (*pinus Khasya*) predominates over all the vegetation and form almost pure pine forest.

At the same and even at higher elevations, intermingled with pines are found oaks, chestnuts, beeches, spruce, magnolias, silver firs, and eucalyptus. There are also plenty of azaleas and rhododendrons growing wild and many kinds of beautiful orchids in the upland forest.

The region between elevations of 300m and 750m of the southern face of central upland, because of extreme sandy character of soil, reflects a dearth of large trees and shrub is noticed. In this area, grasslands prevail with a few species of fern and maranta. Towards the lower section of the same region shrub vegetation becomes somewhat predominant containing lantana, odoratum and ferns.

Further down the slopes, in the war area of the south and bhoi area of the north, vegetation is mixed evergreen whose upper limit is upto 300m approximately. These forests are dominated by sal, sam, chapa, gomari, bpha, sonaru, simul and amari, etc.

4. "Khasi Hills", The Imperial Gazetteer of India, p.255
besides which there also occur bamboo groves, cane and wild bananas.

In the Garo Hills area of the west, mixed evergreen forest is found in interior areas, where besides usual hardwood and softwood trees, occur thickets of bamboo, jackfruit and mango trees. In Garo Hills also occur deciduous vegetation of considerable economic importance. The undergrowth of both evergreen and deciduous forests consists of tall grasses, lantana, ferns, orchids, lillies and wild cherries.

3.1.2. **Physical Setting of Shillong Urban Agglomeration**

3.1.2. (a) **Geology**:

The Shillong urban area, located in the south central part of the Khasi Hills is composed mainly of the rocks of the Shillong series containing quartzites, slates, schists and conglomerates with occasional intrusions of epidiorlites or Khasi Gree stones. The base of the Shillong quartzites is made up of a layer of conglomerates containing cobbles and boulders derived from old Archaean crystalline rocks. This forms the basement complex for Shillong group of rocks (Agnihotri, 1991). The rocks of Shillong series in some places are laid over by cretaceous sandstones of gentle inclination, while on the other parts occur small rounded limestone hills of the Eocene age, which are more common in further south on the Cherra plateau (Chaterjee, 1973). Coal is found in both the Nummulitic and Cretaceous strata.

3.1.2. (b) **Physiography**:

Shillong and its surrounding areas are physio-graphically a
part of the central upland zone of the Meghalaya plateau which is predominantly a dissected hilly area. The geophysical picture of the Shillong hills reflects a saucer like undulating plateau with a general trend of slope from east-south-east to west-north-west over which the streams meander before plunging into deep valleys of the Umiam and Umkher. The highest point in the area is Shillong peak (1964 m.) which is situated within a region of average elevation of 1800-1900 m. above sea level. The northern forested side of the Shillong hills is a rain shadow zone which slopes down quite gently to the lower surface of Greater Shillong. Where average elevation is about 1400 m. above sea level. The entire region of Greater Shillong urban complex poses a topography of alternating rolling hills and valleys. The rivers draining the area are Umkhrah and Umshyrpi, which have plenty of rapids and waterfalls in the neighbourhood of Shillong town. Five physiographic sub-units can be identified here in this area. They are: (i) the northern slopes of the Shillong range; (ii) the Umshyrpi valley; (iii) the Laitumkhrah-Mawkhar upland; (iv) the Umkhrah valley and (v) the Umkhrah-Umshing divide (Singh, 1979).

The physiography of Shillong urban area exerts a great inference on land use and population distribution in different sections. The northern slopes of Lumpering-Laban part being quite steep checks the growth of settlement units and population distribution. This part is rather covered with thick protected forests to prevent soil erosion. But, on the other hand, it is in this part where most of the major sources of drinking water
are located. Again the northern faces of Laitumkhrah-Mawkhar upland, being considerably steep have very poor development of roads and transport-communication systems, and thus have very sparse population.

3.1.2. (c) The Climate

Shillong town with its suburbs though bears climatic characteristics of the central upland of the plateau, also experiences characteristics of a mountain climate by virtue of its altitude. The type of climate may be identified as humid sub-tropical, found usually in the eastern part of the tropical continents. Thus climatically, Shillong represents a transition between the tropical and temperate conditions and bears blended qualities of humid tropics, monsoonal and temperate regions. It experiences weather conditions of former two during summer and rainy seasons and the latter in winter (Hussain, 1984). Regarding the distribution of surface temperature January has been recorded as the coldest month with an average temperature of 10.08 °C. From February temperature begins to rise gradually until it reaches its maximum (24 - 26 °C.) in June and then remains almost stable for the months of July and August, after which it shows a downward trend again. Though the average annual rainfall is 229 mm., there is marked monthly variation, with heaviest rains in the months of June, July and August.
3.1.2 (d) The Soil

The soils of Shillong urban area are commonly of two varieties: (i) the red loam or Hill Soil and (ii) the Lateritic soil.

The hill soil which varies in character from sandy to clay loam, occupies the major part of the area. The lateritic soil, on the other hand, occupies a few patches in and around Shillong. This soil is highly leached and poor in plant nutrition.

3.1.2 (e) The Natural Vegetation:

Pine forests and rolling grasslands are the predominant natural vegetations of Shillong. The pines are found in true forms in Shillong. Within the pines, however, there occurs plenty of orchids, rhododendrons and agehleas. In the lower valleys, there are a few patches of mixed evergreen forests.

3.2 The Socio-Economic Setting

3.2.1 General Population Pattern

Meghalaya has a quite long history of peopling and its present population composition is the outcome of immigration in different volumes which took place at different points of time. Thus, the region bears a heterogeneous structure of population. The tribals, however, predominate in the State. The tribals here again owe their origin to varying ethno-linguistic groups and the two most dominant groups are the Khasis and the Garos. The other groups, though some of them are indigenous of the region, are quite insignificant compared to the Khasis and Garos. Among the non-tribals again, their are several communities who predominate over the others. Thus, the population composition of the State
and their spatial distribution reflect certain interesting features, which need to be introduced while analysing the socio-economic structure of its people.

3.2.1 (a) Population Distribution and Density

According to 1991 census Meghalaya records a total population of 17,60,626 persons distributed over a total area of 22429 sq.km. The distribution, however, is very much uneven within the regions of the State. The district wise share of population varies widely from 657,160 persons (37.33 per cent) of the East Khasi Hills district to 189,043 persons (10.74 per cent) of the East Garo Hills district. There is also a wide difference between the population of rural and urban areas of the State. In 1991 census, the respective shares of rural and urban populations have been recorded as 81 per cent and 19 per cent and this unevenness in rural and urban population is even more marked at the district level (Table 3.1).

<table>
<thead>
<tr>
<th>TOTAL/ RURAL/ URBAN</th>
<th>Meghalaya</th>
<th>Jaintia Hills</th>
<th>East Khasi Hills</th>
<th>West Khasi Hills</th>
<th>East Garo Hills</th>
<th>West Garo Hills</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL</td>
<td>100%</td>
<td>12.45</td>
<td>37.33</td>
<td>12.35</td>
<td>10.73</td>
<td>27.14</td>
</tr>
<tr>
<td>RURAL</td>
<td>81%</td>
<td>13.86</td>
<td>29.84</td>
<td>14.18</td>
<td>12.36</td>
<td>29.76</td>
</tr>
<tr>
<td>URBAN</td>
<td>19%</td>
<td>6.30</td>
<td>69.93</td>
<td>4.36</td>
<td>3.64</td>
<td>15.77</td>
</tr>
</tbody>
</table>

As regards the population density, a similar district wise disparity is noticed. While the East Khasi Hills district records a density of 126 persons per sq.km., the district of West
Khasi Hills has merely a density of 41 persons per sq. km. The other three districts have intermediate densities of 86 (West Garo Hills), 73 (East Garo Hills), and 57 (Jaintia Hills) persons per sq. km. of area. Interestingly, the density of urban population (3,881 persons) in Meghalaya is much higher than that in rural areas (64 persons), which could be the result of having only a few towns in the State.

The growth of population in Meghalaya shows a fluctuating trend from 1901-1991. The growth was spectacular in the decade 1951-1961 and has more or less stabilized since then. However, the state represents a growth rate (31.80% in 1981-1991) which is much higher than that of the National average (23.50% in 1981-1991).

The sex ratio of population in Meghalaya is recorded as 947 females per 1000 Males in 1991 Census. This shows a fall in the ratio from the previous decade 1971-1981 when it was 954. Excepting the districts of the West Khasi Hills and the East Garo Hills, the other three districts also show a decline in the sex ratio in 1991 from 1981. In the five districts of the State, sex ratio varies from 926 F/1000M (in East Khasi Hills) to 976F/1000M (in Jaintia Hills).

In Meghalaya as per 1991 census, 689419 persons out of the total population of 1760626 have been recorded as literates i.e., 39.16 per cent of the total population. The percentage of literacy is considerably high (national level 31%). It is quite low in comparison with the other tribal states of the north eastern region, namely Manipur (49 per cent), Mizoram (67.4) and
Nagaland (51.1). But it is interesting to note that, though there has been an appreciable rise in the literacy rate in Meghalaya from a mere 4 per cent in 1901 to 39 per cent in 1991, the rise is quite below the mark of expectations in a State where Christian Missions have been able to establish a good control over people of the region. This low rate of literacy is actually due to a combination of several factors. A detailed analysis of these have been dealt with in latter chapters.

The male female ratio in literacy, however, does not vary much in the State as well as in the district level. The urban literacy rate remains obviously high than its rural counterpart not only in the State but also in the districts.

Though there is a considerably high share of population upto the primary level of education (male 50.93% and female 55.76%), however, at higher level enrollment gradually decreases. There is not much variation in the rate of enrollment in different educational levels between the male and female population of the state and the same is also reflected in the case of both rural and urban population. It is however, interesting to note that, inspite of having such a wide range of variation in the level of educational attainment, maximum number of literate persons are educated only upto the middle school level (table 3.2).
TABLE - 3.2
Percentage Distribution of Male and Female literates in Different Categories of Educational Attainment, 1981

<table>
<thead>
<tr>
<th>Level of Education</th>
<th>Male</th>
<th>Female</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary School</td>
<td>50.93</td>
<td>55.76</td>
<td>8.93</td>
<td>7.16</td>
</tr>
<tr>
<td>Secondary/PU/Intermediate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Matric/Secondary</td>
<td>22.36</td>
<td>17.75</td>
<td>0.52</td>
<td>0.07</td>
</tr>
<tr>
<td>Tech.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diploma/Cert.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Census of India, 1981. Series 14, Meghalaya Part II A & B and Meghalaya Part III A & B and Part IV A & B

Meghalaya contains people belonging to several religious groups who are again divided into a number of sects (Table 3.5).

Evidentially, Christianity stands as the first and foremost religious group (52.64% of population) both among the rural and urban population of the state as well as in its districts. This has been the result of a long process of Christianity which started from 1841 with the establishment of Welsh Presbyterian Missions in the region. The other religious groups of significance are the Hindus (17.99%), and Indigenous religion and persuasion groups (25.78%), i.e., a combination of number of small tribal religious groups.

At the district level, the West Khasi Hills district has the highest number of Christians, while the West Garo Hills has the lowest. The Hindus are mostly concentrated in the districts of East Khasi Hills and West Garo Hills. All the five districts of
the state have almost equal share of people practising Other Religions and Persuasions.

Khasis, Pnars and Garos constitute the major groups of people belonging to the Other Religion and Persuasion category in the region. The Khasis making 43 per cent of this category are concentrated in the two districts of East and West Khasi Hills. Similarly, the other two groups, i.e., the Pnars (3 per cent) and the Garos (0.43 per cent) are found concentrated in the Jaintia Hills district, and East and West Garo Hills districts respectively.

The tribals in Meghalaya constitute 80 per cent of total population. The rural areas have obviously a higher share of scheduled tribes than the urban areas of the region. The urban areas, because of their heterogeneous composition of population, contain less number of tribals. It is, however, interesting to note that the number of tribal females is much more than their male counterpart all throughout the state. The major tribal groups in Meghalaya are the Khasi-Jaintias and the Garos making 58.35 per cent and 37.67 per cent respectively of the total tribal population.

3.2.2. Population composition In Shillong Urban Region.

Shillong, being the biggest urban centre in Meghalaya, as already mentioned, accommodates the largest number of urban population. The total population of the town is 2.22 lakhs (1991), distributed over an area of 25.40 sq.km. Thus about 70
per cent of the total urban population of Meghalaya is concentrated in the town. The Shillong Municipality alone shares as good as 59 per cent of the total population of the Agglomeration.

The density of population in Shillong region, as a whole is 8,751 persons per sq. km. of area. Individually, Shillong Municipality has the highest density of population (12615 persons per sq. km.) and Madanrting has the lowest (4231 persons per sq. km.).

The population growth in Shillong, shows a lower rate in 1981-91 (27.23 per cent) compared to the previous decade 1971-81 (42.32 per cent). In fact, population growth in Shillong has experienced a frequently changing trend over the decades from 1901 to 1991.

The number of females per one thousand males in Shillong is recorded only as 896 in 1991 census, while in 1981 it was 905. The sex ratio of Shillong's population has also shown a changing pattern like the growth rate over the last nine decades.

The tribal population in Shillong, according to 1981 Census is 85,833 persons making only 7.97 per cent of the total tribal population of the state. However, when compared with urban tribal population alone, it shares about 64 per cent of the same. Among the tribals, Khasis make the most conspicuous group here, accounting for 60 per cent of the total urban tribals. Garos on the other hand, is a very insignificant group here contributing only 1.5 per cent of the total urban tribal population.
away to settled wet cultivation to a major extent.

The most striking characteristics of agricultural economy of Meghalaya, in both the cases of shifting and settled cultivation is production of wide variety of crops ranging from food crops (rice, maize, millets), and vegetables (potato, sweet potato, chillies) to cash crops (sugarcane, pepper, turmeric). The cropping pattern is, however, quite distinct of the jhum as well as settled cultivation lands of the tribals from that of the lands cultivated by the immigrants in the western and northern parts of the state (Das, Sing and Sharma, 1971).

Besides agriculture, other land based economies in the state are horticulture and raising of livestock and forestry which together engage 6.57% of total workers. Among the livestock, cattle occupy the most significant place followed by goats and buffaloes. The animals are raised for the purposes of milk, meat and agricultural usage. The rearing of cattle and raising livestock is usually carried on in the low-lying areas of western Garo Hills, Jaintia Hills and northern foothill section of the Khasi Hills as well as in the neighbourhood of Shillong and other Urban Centres. A large number of nepali immigrants are engaged in this sector of economy in the state.

The state has a total forest coverage of 851.4 thousand hectares accounting for 37.95% of total geographical area (NEC Report, 1992). However, most of the forests in the state are owned by private individuals (91.52% of total) and only a little (8.29%) is owned by the Forest Department. Thus, it is difficult
to make a proper assessment of forest products of the state. The significant sources of forest revenue are sal, bamboos, timberlac and tezpat (bay leaf). The other significant primary economy in Meghalaya is mining and quarrying, which engage about 1% of total workers. Though the state is quite rich in mineral resources, commercial exploitation has been possible only of coal, limestone, sillimanite and very recently of uranium deposits. As regards the distribution of minerals, it is observed that coal is available in the eastern part of Garo Hills, southern part of Khasi Hills and Jaintia Hills, together accounting for 459 million tons of coal reserves. Limestone, which is worth of 4.23 million tons, is distributed mainly in Cherrapunji-Dawki area. Sillimanite is extensively found in Sonapahar area of west Khasi Hills districts, which accounts for about 95% of country's total output.

3.2.3 (b) Secondary Economy

The secondary economies in the state together engage 2.15% of total workers. The manufacturing and processing industries, being mostly held in small and medium scales, provide employment opportunity only for a small section of working population in Meghalaya. The notable industries are the cement industry at Cherrapunji, the plywood and fruit processing industries at Burnihat, timber processing factory at Darugiri etc. There are, however, a number of small scale industries based in and around Shillong urban agglomeration.
3.2.3 (c) Tertiary Economy

The tertiary activities in Meghalaya is quite significant, which engage 23.08% of total workers of the state. However a major bulk of tertiary workers (64.02%) find employment in the Central and State Government offices and other administrative organisations. Meghalaya being a hill state, transport and communication network are not much varied. The most notable system of transport are the roadways, which are again best developed in the central and eastern Meghalaya. One National Highway (No. 40) runs through the state which connects Shillong with Guwahati on one hand and Silchar on the other and thus maintains link with most important socio-cultural nodes of Assam.

Table 3.3

<table>
<thead>
<tr>
<th>Sectors of Economy</th>
<th>Percentage of Population to Total Workers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Persons</td>
</tr>
<tr>
<td>Primary: Cultivation and Agri. labour</td>
<td>67.21</td>
</tr>
<tr>
<td>: Forestry, livestock and horticulture</td>
<td>6.57</td>
</tr>
<tr>
<td>: Mining and quarrying</td>
<td>1.00</td>
</tr>
<tr>
<td>Secondary: Manufacturing, Processing, Servicing, Repairing</td>
<td>2.15</td>
</tr>
<tr>
<td>Tertiary: Construction, Trade, Commerce</td>
<td>23.08</td>
</tr>
</tbody>
</table>

Source: Census of India, 1991, Series 16, Meghalaya

The internal waterways in Meghalaya are not much extensive and are concentrated in western Meghalaya, where the lower parts of Simsang and Krishnai rivers are navigable. In central
Meghalaya, however, short distance transport is carried on in the rivers of Digaru and Barapani.

The airways are least developed in the state with only one aerodrome being located in Umiam near Shillong town, which receives weekly passenger flights. The other significant tertiary activities are construction (6.88% of total tertiary workers) and trade and commerce (22.81%), both of which having maximum concentration in Shillong urban region.

3.2.4. Economy Pattern in Shillong Urban Agglomeration.

Shillong Municipality with its Cantonment Base and other towns together contribute 30.47 per cent of total working population, of which 30.05 per cent is main worker and 0.42 per cent is marginal worker. The percentage distribution of workers in different Sectors of economy (Table 3.4) shows that the Secondary and Tertiary Sectors take the lion’s share of total work force leaving a very insignificant number of workers to be engaged in the primary sector.
TABLE - 3.4
Percentage Distribution of Workers in Different Sectors of Economy in Shillong Urban Agglomeration

<table>
<thead>
<tr>
<th>Town/City</th>
<th>Cultivators</th>
<th>Agricultural Labourer</th>
<th>Workers in House Hold</th>
<th>Workers in Industries</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHILLONG URBAN AGGLOMERATION</td>
<td>TOTAL</td>
<td>1.26</td>
<td>1.68</td>
<td>1.83</td>
</tr>
<tr>
<td></td>
<td>MALE</td>
<td>1.11</td>
<td>1.47</td>
<td>1.80</td>
</tr>
<tr>
<td></td>
<td>FEMALE</td>
<td>1.68</td>
<td>1.93</td>
<td>1.93</td>
</tr>
</tbody>
</table>

Source: Census of India, 1991 (Provisional)

As in the other regions of the state, here too, the primary economy is dominated by female workers, but in the secondary and tertiary sectors, the females are not much behind the male workers.

Non-working dependent population in Shillong according to 1991 census being 154536 makes a 69.5 per cent of total population. This high percentage of non workers indeed exerts a heavy pressure on limited working population. The large number of non workers in this biggest urban centre of the state may be attributed to the presence of a fairly large number of student population here.
REFERENCE


3. M.S. Krishnan: "The Archaean Growth of Penninsular India (Assam Region)", in *Geography of India and Burma*, Delhi, 1982, pp 133-134


11. Basic Statistics of North Eastern Region, NEC, 1992