CHAPTER II

PHYSICAL FRAMEWORK OF NAGALAND
Nagaland emerged as a state, out of the Naga Hills district of Assam and NEFA province in 1st December 1963 as the then 16th state of the Indian Union. It is located in the eastern-most part of India. Lying between 25° 6’ N and 27° 4’ N Latitudes and between 93° 20’ E and 95° 15’ E Longitudes, it has an area of 16,579 sq. km. It is bounded by the states of Arunachal Pradesh on the north-east, Manipur on the south and Assam on the west. The state shares an international border with the adjacent country of Myanmar on its extreme east and it is almost equidistant from the tri-junctions of Indo-China-Myanmar in the North-east and Indo-Myanmar-Bangladesh in the south.

2.1 Physical setting

The topography of Nagaland depicts a young mountain terrain feature, full of hilly ranges that break into a wide chaos of spurs and ridges. Barring only 8% of plain area which is limited to Dimapur, Jalukie and adjoining areas of Assam, its altitude varies between 194 m and 3048 m above mean sea level. The mountain system of Nagaland is an off-shoot of the Himalayan mountain system running from North to the South. Orographically, the mountain system can be classified into four distinct ranges:

(i) The Low Mountain Range: This mountain range lies along the Assam-Nagaland border, and is composed of rather low hills of altitude less than 1000 m. This range starts from Jalukie and runs in a northerly direction through the length of Nagaland. It encloses some of the richest agricultural valleys in Nagaland like Jalukie valley, Medziphima valley, Baghty valley, Changki-Tsurang valley and Tiri valley within the territory of Zeliangs, Angamis, Lothas, Aos and the Kongyaks respectively. Oil well is also located at Chumukedima area and Champang area in this range.

(ii) The Middle Mountain Range: This, consisting of mostly ranges and some lateral off-shoots runs in an east-west direction. Most of the villages of Naga-tribes—Angami, Chakesang, Pochuri, Yimchunger, Lotha, Ao, and Sema etc are located here. It is adorned with peaks which are higher than 1800 m and thick forests rich in flora and fauna. The Zanubou-Satoi mountain range is the easternmost as well as the most elevated of this system.

(iii) The Patkai Mountain Range: This mountain system forms the international boundary between India and Myanmar, the highest peak of this range being Saramati which is 3840 m in height. It is covered with thick forests encompassing
the biggest forest area of Nagaland. The Shiloi Game Reserve Forest and the Sangtam-kuki protected forest are located in this mountain system.

(iv) The Barail Mountain Range System: It runs in an east-west direction and becomes progressively lower towards the west. This mountain system extends from Nagaland to Manipur and from Manipur to Meghalaya. The Japfiu range with Japu (3014 m) is the easternmost part of this system. The Dzükou in the easternmost part of the Barail mountain system is almost a table-land. This mountain range is the home of Angamis, Maos, Chakesangs and the Zeliangs

2.2 Geological structure

The Geology of Nagaland (Fig: 2.1) which constitutes the northern part of the Indo-Burma ranges is bounded on the western part by the pre-Cambrian Mikir Hills Massif and tertiary shelf sediments of Assam plains, and on the north-west by the Brahmaputra plains through lineaments. On the eastern side lies the western

central low land of Myanmar containing a gigantic thickness of Cenozoic sediments. In the north the state runs into the so called 'Eastern syntaxial bend' of the Himalayas and in the south it passes into the hills of Manipur and Cachar (Assam) enclosing tertiary sediments. In the South-east ward these hills run through Chin Hills and Arakan Yomas (Myanmar) into Andaman-Nicobar Island in the Bay of Bengal and link up with the chain of Islands off the coast in the Indian Ocean. The hills of Nagaland, created during the Tethyan orogenic belt form a part of the Alpine-Himalayan mountain chain. These are built up mostly by the thick sequence of Cenozoic and late Mesozoic sediments. These sediments are bounded on the eastern side by Ophiolite complex and shelf sediments along the eastern periphery of the state bordering Myanmar. In the western part of the state, the most prominent morphotectonic sedimentary crustal block is the 'Belt of Schuppen'.

The general rock sequence in the state can be grouped into:-

1. The Nimi formation of Paleozoic age.
2. The Ophiolite complex of upper cretaceous.
3. The Disang group of lower and middle Eocene age.
4. The Barial group of Eocene and Oligocene age.
5. The Surma group.
6. The Tipam group.
8. The Dihing group of Pliocene-Pleistocene age.
The eastern fringe of Nagaland which is covered by Nimi formation extents from Mollen in the south to Saramati in the north for about 30 km in length. It is thrust over the ophiolitic complex from the east and it consists of crystalline limestone, quartzite, phyllite, etc. The ophiolite complex which also occurs in the eastern part of Nagaland is tectonically sandwiched between the Nimi formation in the eastern side and the Disang formation in the western side. Minerals such as magnetite, nickel, chromium, cobalt copper zinc, etc mostly occur in the area characterized by Ophiolitic complex of the state. Nearly half of the surface area of the state is covered by the Disang group of rocks comprising a very thick sequence of fly ash sediments that occurs in the intermediate hill regions. The Disang group gradually merges with the overlying Barial group of rocks which are predominantly mollasic sediments. The Barials which crop out as outlines over disang in some higher ridges in the intermediate hill areas are mainly confined to the ‘Belt of Schuppen’ in the outer hill areas. The main rock types found in the Barial group are well bedded sandstones, shale, clay and coal. The Barial rocks are followed by an unconformity over which Miocene Surma group of rocks are deposited. The Sumas that are Mollassic sediments of sandstones, shale and clay are exclusively confined to the ‘Belt of Schuppen’. The Tipam groups of rocks which overlie the Sumas are also found in the ‘belt of Schuppen’, though they also occur in the eastern high hill areas.

61. Op Cit, Directorate of geology and Mining (1978) p5
NAGALAND

GEOLOGY

Fig: 2.1
where they overlie the Disangs. In the western part of Nagaland, the Namsang beds are found overlying the Tipam group of rocks which are absent in the intermediate and eastern hill ranges. The rocks of Namsang bed consist of a poorly consolidated Litho-sequence comprising conglomerate, grids, mottled clays and sandstones. The Dihing group, on the other hand, resting over the Namsang beds with a minor unconformity is found in a few places only in the outer areas of the state. Gravels, thin clays and sands are the main constituents of the Dihing group. Mineral resources are seems to be more in the eastern part of the state. The Nimi formation in the eastern fringe conceives the largest limestone deposits of the state. The associated sheared granites, schist and quartzite are found in this formation. The ophiolite belt also provides diverse mineral presence represented by podiform chromite, magnetite, nickel, cobalt, base metal, asbestos, etc. The Disang sediments spreading over a vast country of intermediate hill ranges too exhibit occurrences of limestone, brine springs, slates, black shales and pyrites. The Barial group of rocks occurring mostly in the ‘Belt of Schuppen’ is rich in coal. And the important coal belts in the state are in Borjan and Tiru-valley. The Tipam and Surma groups of rocks also hold promise for yielding glass sands, clays, iron laterites and building materials.
2.3 Drainage system

Nagaland being hilly is gifted with a number of both perennially and seasonally flowing rivers (Fig: 2.2). The major drainage systems in the state are Doyang, Dikhu and Tizu. These river systems are of dendritic nature. Dhansiri, Doyang and Dikhu rivers run towards west and flow into the Brahmaputra. On the other hand, the Tizu river system flows towards the east and joins the Chindwin River in Myanmar.

Doyang is the largest as well as the longest river in the state. It originates from Japvo hill in the southern part of the state. Raising near Mao in Manipur state it flows in a north-easterly course for about 72 km and ultimately turns sharply to north-west direction forming a rectangular drainage pattern. This river drains areas of different districts. In the south it flows through Kohima district and flows towards the eastern edge of Phek district. Flowing northward it enters Zunheboto district and then runs through Wokha district. After flowing towards south-west of wokha district leaves the hills and finally falls into Dhansiri in Sibsagar district of Assam. Doyang is joined by many streams in its central and western part. Chubi is a supplementary system of Doyang which flows southward from Mokokchung district and joins Doyang. Originating from Nerhema in Kohima district, Nzhu is another tributary of Doyang. It flows through Miphong in Rengma area and joins Doyang in
Wokha district. Dikhu is another important river in the state; it originates near Nuroto hill in Zunheboto district and flows towards north along the border of Mokokchung and Tuensang districts. In the north, it is joined by Yangyu, an important river in Tuensang district. From the confluence, Dikhu flows north and then turns west and passes through Mokokchung district and Mon district and flows past Naginimora (Mon district) to join Brahmaputra in Assam. Dhansiri rising from the south-west part of Kohima district flows in the south-western part of the state. It runs in a westward course forming a natural boundary with north Cachar hills of Assam at the extreme south-west of the state. From Cachar, it takes an eastward direction and flows through Rangapahar-Dimapur plain in Dimapur district. Leaving the district it flows northward until it falls into the Brahmaputra. This river receives almost all the western and southern drainage of Nagaland. Tizu forms an important drainage system in the eastern part of the state. It assumes a special significance as it exposes the Ophiolite complex of Nagaland in its deep gorge sections providing vital geological information. The river rises in the southern part of Tuensang district and flows towards the north. After flowing in a northward direction it turns eastward and then to south-east direction joining the Chindwin in Myanmar. Zunki is an important tributary of Tizu River. It originates in the eastern

NAGALAND
DRAINAGE SYSTEM

Fig: 2.2
corner of Tuensang district and flows southward to join Tizu in the south. Tizu are also called Ti-ho or Nantaleik. Milak which is known as Jhanzi in Assam is another important river that flows across Ao territory in Mokokchung district. Its source is found in the heart of Mokokchung town at an altitude of about 1,300 m above sea level. It flows northward until it leaves the hills and turn west-ward for the Plains near Amguri (Assam). In the plains it flows through Sibsagar district. Tsurong is another river which rises in the east of Lakhuni village and flows between Yachang and Lirmen villages on the one side, and Molung village on the other in Mokokchung district. Besides these rivers, there are a large number of rainfed rivulets, the beds of which remain dry during the dry season.

It can be stated that the river basins coupled with physiographic conditions have performed the role of natural ecosystem where the separate tribal groups have settled and have acquired definite and distinct characteristics. Naturally, these rivers form the territorial boundaries of different tribal groups in the state. This can be identified in the case of the Doyang River which acts as a demarcating line of several tribal groups such as Rengmas, Angamis, Lothas and Aos. Similarly, Dikhu running in the territory of Aos, Sangtams, Phoms and Konyaks, acts as the boundary. Furthermore, these rivers influence to a great extent the settlement, the social milieu as well as the economic pattern of the people in the state.
Nagaland has a typical Monsoon climate with variations from tropical to temperate conditions. It is generally cool in winter and pleasantly warm in summer especially in the interior places and higher hills. In winter the night temperature comes down from 4°C Celsius to 1°C Celsius in December, January and February which are the coldest months in the year. The temperature does not rise beyond 32°C Celsius, and the average summer temperature is 22°C Celsius to 27°C Celsius. The average annual rainfall for about 7 months from May to October is between 200 cm and 250 cm. As it is in the subtropical areas Nagaland has four characteristic seasons: (i) Cold season (winter), (ii) Hot season (pre-monsoon), (iii) Rainy season (monsoon) and (iv) Cool dry season (retreating monsoon). The cold season begins in December with a steep fall in temperature, and it continues till the first week of February. During this period the cold wind which blows from the high ranges of Saramati in the eastern part of the state mixed up with the north-east monsoon winds and blows particularly over the eastern part of the State. January is the coldest month all over the state, when frost falls in a few places like Zunheboto, Phek, Kiphire, Aghunato, Pfutsero, etc. The average temperature in winter season varies from 10.48°C to 17°C; and the average rainfall is generally low during this period. It is followed gradually by hot season during March and April. From the first week of March with a gradual rise in temperature the pre-monsoon starts.
NAGALAND
MONTHLY AND ANNUAL RAINFALL

Fig: 2.3
This period is characterized by strong winds, accompanied by thunderstorms. The wind generally blows from south-west and at times the velocity raises up to 100 km per hr, making the sky clear almost throughout the day. The rainy season (Fig: 2.3) includes the months from May to September. It is the monsoon season which sets in the middle of June and continues up to the middle of September. The temperature raises up to 25°Celsius in July, and it is also during this month of July up to 25°Celsius, that the heaviest rainfall is experienced. The average relative humidity during this period is around 85%. The period from September to November is treated as cool and dry season as this period is neither too hot nor too cold. From the month of September the temperature as well as rainfall decreases and the land experiences the onset of retreating monsoon. And whenever there is depression in the Bay of Bengal the sky over the state becomes overcast and there is drizzling and rainfall heavier than that in the Gangetic west Bengal.

2.5 Soils

The soils in Nagaland except in the valleys and along the foothills are generally thin. Steep slopes, heavy rainfall and the extensive practice of Jhum cultivation are mostly responsible for making the soil cover thin. The materials are washed away from the hill-slopes easily and are deposited in the valley and along the foot of the hills. The state has a variety of soils (Fig: 2.4) depending upon the topographical and
NAGALAND

SOILS

Fig: 2.4
The soils of southern Nagaland covering the districts of Kohima, Phek, Zunheboto and the southern portion of Tuensang district mostly consist of high base status soils of humid regions, shallow black, brown soils. Recently formed soils and alluvial soils are found in the west covering the district of Wokha and Mokokchung. The soils are black and brown similar to the alluvial soils found in the northern India. In the northern part of the state covering the district of Mon, the northern part of Mokokchung and the district of Tuensang, the soils are of high base status, red loamy, red sandy and alluvial soils, shallow black, brown and alluvial soils of northern India\(^{63}\), high base status soil and brown soils. Except in the valleys and along the foot hills with comparatively level land and gentle gradient, the soil cover in Nagaland is thin. Soils in Nagaland are in general, acidic and the PH value ranges from 4.8 to 5.62. The organic carbon contents of the surface soil are quite high, but the soils are very poor in available phosphate content. The soil texture varies from sandy loam to silty coarse sandy and sandy loam. Primarily, the soils of Nagaland can mainly be grouped under Entisol, Oxisols, Mollisols and Spodosole. Entisols are the alluvial soils occurring mainly in the valleys and foot hills of the western and south western part of the state. These soils are characterized by Ochric epipedam, low organic matter and lighter color. This soil comprises of the most important soil type for agriculture. Oxisols are strongly weathered soils characterized by low Base Exchange capacity, friable and

---

\(^{63}\) ICAR (1884) *Soils of India*, National Bureau of Soils Survey and Land Used Planning, Nagpur
massive structure. These soils occur mainly over the foot hills and lower ranges in mid-southern part as well as eastern part of the state, more or less up to an elevation of 750 m above sea level. These soils have a prolonged day period (rain shadow area) and are predominantly covered by degraded grass and bamboo forest. Mollisols occur over cool and temperate areas with temperate rain forest and are characterized by a mollic epipedam, high organic matter and high base saturation. This type of soil is mainly found in the intermediate high hill ranges in the state. Spodosol type of soil is mostly found in the central, southern and eastern part of the state which is of higher altitude with humid and temperate climate suitable for coniferous vegetation.

2.6 Natural vegetation

Though Nagaland is a small state, it is endowed with a wide variety of forest types (Fig: 2.5) on account of its unique geographic locations and a wide range of physiographic terrain. Based on the floristic composition, the forest of Nagaland can be primarily divided into two groups: Coniferous and Broad leaved forest. Coniferous forest is confined to Phek and Tuensang districts, bordering Manipur state and Myanmar; while the Broad-leaved forest is scattered all over the state. The variation in altitude, climatic condition and soil types have a great effect on the growth of vegetation in the state. Depending upon those factors, forest types in the
NAGALAND
FOREST TYPES

Fig: 2.5
state can be classified into: (i) Sub-tropical moist deciduous forest, (ii) Sub-tropical evergreen rainforest, (iii) Temperate evergreen highland forest, (iv) Coniferous forest and (v) Degraded growth. The Sub-tropical moist deciduous forest are confined to the elevations between 200 and 450 m above mean sea level and represent one of the major ecological types in the state of Nagaland with a rich floristic diversity. This forest covers the western and the north-western part of the state bordering Assam in the west and Arunachal Pradesh in the north, and the south-western foothills of the state. There is a bewildering wealth of species in this forest. Some important species of trees are hollock (terminalia myriocarpa), gamari (gmelina arborea), gogra (schima wallichii), amari (amoora wallichii), etc. There is a variety of canes (calamus) in this forest, especially in the foothills. Apart from the canes, numerous shrubs and herbs cover the ground. The thick vegetative cover of this forest is being lost in many places due to extensive jhuming and also due to unregulated felling of timber trees. The Sub-tropical evergreen forest is concentrated on the areas receiving an annual rainfall of about 200 cm and within a varying range of elevation from 400 m to 1400 m. This type of forests is found in the north-western part of the state and in around Tizit (Mon district). The flora is quite diverse, especially in the lower elevations where the forest merges with patches of semi evergreen forest. The forest exhibits multitiered nature of different storeys which are not quite distinct. Further, the species are very irregular. Some important species of trees are: hilika (terminalia myriocarpa), hingori (castonopsis indica),
koliari (cyclastemon assamicus), moj (allbizzia lucida), etc. Some of the important commercial species of trees are found in great profusion in this forest. Temperate evergreen highland forest is mostly confined to higher elevation from 1300 m to 3500 m above mean sea level. Due to heavy rainfall and high humidity the vegetation is quite luxuriant. It is found along the international boundary in the eastern part of the state and also in a narrow strip of land running from north to south in the middle part of the state. The top canopy is constituted by commercially important species such as champa (cichilia champaca), amari (amoora wallichii), simul (bombax ceiva), hollock (terminalia myriocarpa), urium (bischofia javanica), etc. The branches of these trees are heavily moss-laden and offer a suitable habitat for a luxuriant growth of epiphytic species, orchids and ferns. Coniferous forests are found mainly in the areas of colder and higher altitude in the south-eastern part of the state, of Tuensang and Mon districts. The elevation varies from 1600 m to 2000 m and the average annual rainfall is around 175 cm in those areas. Pines (Pinus insularis) are the principal species which occurs in almost in pure strands. Occasionally broad-leaved species such as Gogra (Schima wallichii) are also noticed interspersed among these pines. Degraded growth are mainly confined to old jhum fallows and are most widespread covering around 40% of the total area of the state. Besides these forests, there are number of reserved forest namely the Intangki, Rangapahar, Singpham, Fakim, Puliebadze. The Intangki and Rangapahar are located in the south western part of the state; and Singpham is situated in the north
western part of the state. The total area of land covered by forest in Nagaland is around 862930 hectare, constituting only 17.3% of the total geographical area. The low percentage of forest cover to total area in the state is mainly due to the practice of shifting cultivation in the rural areas, and the unregulated feeling of trees for timber and fuel. As a result, extensive areas get depleted every year; the natural fertility of land and its valuable forest resources are destroyed denuding the potential forest land. Moreover, the increase in human population, heavy incidence of grazing and pressure on land for agriculture and settlement are responsible for depletion of forest cover in the state. Realizing the gravity of the situation created by wanton felling of trees and the damage to the environment caused by the traditional practice of jhum activities, efforts are being made by the government of Nagaland to check the further destruction of forest.

2.7 Transport and Communication

Till 1957 when Naga Hills Tuensang area was formed there was only limited network of Transport and Communication in the state. However, after the statehood of Nagaland in 1963, a great stride in development works of roads was initiated; existing roads were widened and metalled. At present, Dimapur-Kohima-Imphal (National highway Number 39); Kohima-Mokokchung-Amguri (National highway Number 61); Mokokchung-Tuensang; Mokokchung-Zunheboto; Kohima-
Thus, it has shortened the social distance and has helped in the development of roads. Now buses ply from Kohima to Dimapur; Kohima to Wokha; Kohima to Zunheboto; Kohima to Phek; Kohima to Kiphire etc. Regular services ply from Mokokchung to Mariani; Mokokchung to Tuensang; Mokokchung to Zunheboto; Mokokchung to Amguri; Tuensang to Kiphire; Mon to Sonari; Dimapur to Guwahati; Jorhat; etc. The department operates services in 102 routes covering even remote villages in the state. The total fleet strength during the year 2000 was 223 numbers. The road development in Nagaland cannot be said as uniform due to constraints imposed by the topography and rugged terrain.

The western part where, the land is not so rough and rugged does not face much problem. Many communities in the eastern portion are without any sign of metalled road for approaching or connecting them with other places. However, development of roads has been going on in a rapid phase despite the inhospitable and rugged topography. Thus, it has shortened the social distance and has helped in the
Fig: 2.6
convergence of fellow feelings among the people who were then in their own world separated by geographical distance and isolated from one another. The hilly topography of Nagaland forbids development of railways. The main line of the North East Frontier Railway from Guwahati to Dibrugarh passes through Nagaland only in a small area having a station at Dimapur. This station caters to the needs and commercial transactions between the states of Nagaland and Manipur with other parts of the country. Another railway line from Simulguri to Naginimora in Mon district was laid as a branch line of the North Eastern Frontier Railway. This line was initially introduced for carrying the coal of Borjan colliery through Naginimora. It serves the needs of the passengers particularly in the north western part of the state. Many passengers especially of Tsurangkong and Japukong area of Mokokchung District and also Ralan and Bandari area of Wokha district board from Moriani (Assam) to go to Dimapur or to the other part of the country. The only aerodrome in Nagaland is located at Dimapur. It was constructed during the Second World War for military purpose. Be that as may, it fell into neglect and remained unused for a long time after the cessation of the war. The need for it revived and was revamped with the outbreak of insurgency in 1956 for evacuating wounded soldiers by air. Only after the state of Nagaland came into being it was used as a regular airport for flights from Calcutta to Dimapur in the early 1960s. Now, it connects flights from Dimapur with Jorhat, Calcutta and Guwahati, etc.
During the time of Independence of India there were only three post offices in Naga Hills, located at Dimapur, Kohima and Mokokchung, and two extra departmental branch post offices at Wokha and Zunheboto. After the statehood of Nagaland, a postal facility was gradually extended to all other administrative headquarters and some villages. In 1970 the Nagaland postal division was created and headquarters was set up at Kohima. All the district headquarters are now served by telephone. In 1973 Nagaland telephone division was created and now it functions from Dimapur. Telecommunication services in the state have made significant progress in the last decade, though it is still very inadequate. At present, there are 326 post offices spread throughout the State. Mobile phone services have also been recently launched in the State.