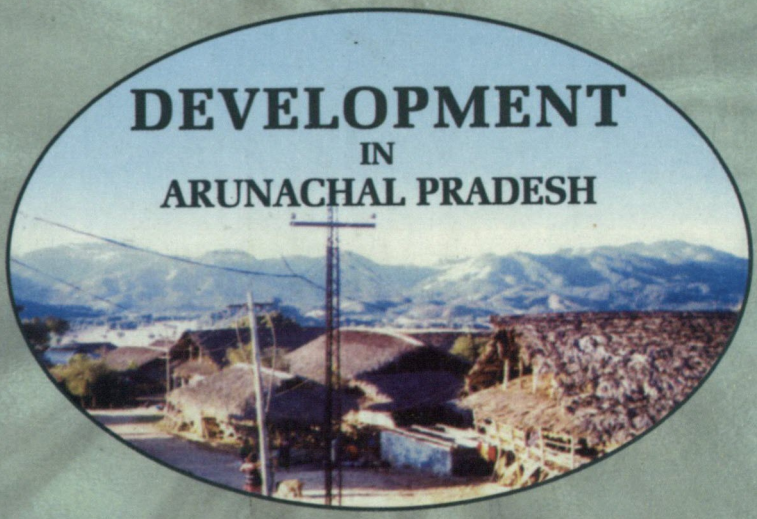
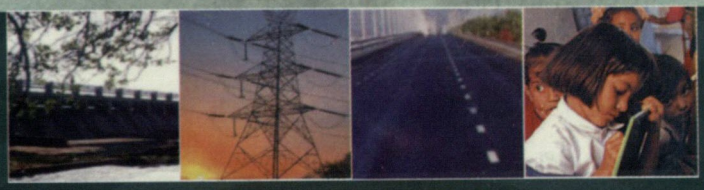
PATHS OF

DEVELOPMENT
IN
ARUNACHAL PRADESH





Ravi S. Singh

Like any other region, Arunachal Pradesh too, has unique experience in terms of evolution and development. The importance of this state lies in its geo-strategic location, rich multi-ethnicity and abundant natural flora and fauna. Over last 55–56 years in the post-independence era, Arunachal's personality acquired a new shape. However, the available works on it are largely either historico-cultural or anthropological. The book in your hand takes you to a different journey—a journey into different facets of development as occurred in Arunachal.

This book focuses on

- **Comprehensive** geographical background of Arunachal Pradesh
- Developing and understanding of existing land use patterns and **factors responsible** for changes among land use categories
- **Identification** of levels of agricultural development and regionality
- **Infrastructure** (roads, telecommunications, post-offices, banks, electrification) growth and intra-state distribution
- **Under-utilisation** of education and health opportunities crucially shaping general development
- **Gender situation** in Arunachal analysing sex-ratio, education and economic participation

Areas Covered: Geography/ Gender Studies/ Regional Development/Area Studies

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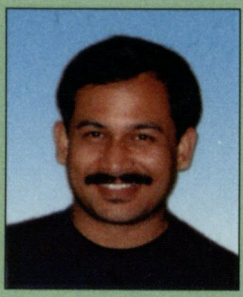

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Contents

1

Introduction

The Geographical Personality

The present far north-eastern state of India, called Arunachal Pradesh today, was known as the North-East Frontier Tract, NEFT and North-East Frontier Agency, NEFA in the yesteryears. It has a geographical area of 83,743 km² and a total population of 10,91,117 persons (2001). It possesses unique geographical personality with the predominance of mountains and hills; an extensive network of river systems sculpturing the natural landscape; and, pleasant climatic conditions varying from sub-tropical to alpine type conditions depending upon the altitude. The National Bureau of Soil Survey identifies nine soil types here, none of which occur independently. Experts identify a vast potential in this state for hydel power generation. It is one of the richest states in terms of forest resources; however, minerals' presence is insignificant. Culturally, Arunachal Pradesh is highly rich but the same does not stand true if we go by the concurrent yardstick to measure the human resource and its development.

Orientation

Instead of dealing directly into the core concern of this book, it is proposed to put forth some basic facts of Arunachal Pradesh. The underlying assumption is general people, even in the north-east, do not have any authentic and correct idea about this state. Such a condition necessiates a brief introductory remark on the geography of Arunachal Pradesh.

Arunachal Pradesh (26° 28′ N to 29° 31′ N latitude and 91° 31′ E to 97° 30′ E longitude) shares international boundary with Bhutan in the west, Tibet (China) in the north and the north-east, and Burma (Myanmar) in the east; Assam and Nagaland surround it in the south-west and south respectively. It had been known by other names in the past. It was called North-East Frontier Tract upto 1954; then, it was re-named as North-East Frontier Agency during 1954-1972; and since 1972, when the Union Territory (UT) status was accorded to it, it is known to us as Arunachal Pradesh. Literally, 'Arunachal Pradesh' means 'the Land of (Rising) Sun'. One and a half decade later, Arunachal Pradesh attained full statehood. With the establishment of the Itanagar bench of the Honourable High Court of Guwahati recently in 2001, another milestone in politico-constitutional development is achieved. One may assume that would further strenghten the constitutional/legal system in the state to benefit common Arunachalis in getting quicker redressal of their legal grievances.

The Geographic Foundations

Under this section, salient features of the inter-related fact of geologic formations, consequent physiography, the drainage systems and climate are presented.

Geology

Due to the lack of a complete geological survey, many details in this regard are yet not clear despite the fact that professional interests to understand this aspect date back to the 19th century. Evidences of the Upper Tertiary formations and Lower Gondwana formations in

association with the unfossiliferous sediments are significantly found in this region. However, the traces of the (*Adi*) volcanics found in between are still difficult to explain. Some studies reveal exposures of permo-carboniferous sediments of marine origin too. Regional scientists (Singh, *et. al.* 1971) identify two broad divisions: the Eastern Himalaya and the Eastern Hill Zone or Purvanchal. The Eastern Himalaya has four structural units—the Sub-Himalaya, the Lower Himalaya, the Higher Himalaya, and the Tethys sediments, great thickness covering the Higher Himalaya (Gansser, 1963). The Eastern Hill zone is believed to be a component of the Assam-Burma geological province which had been a part of the Tethys Sea during the Archean period. The present shape to it is the consequence of successive organic movements finally taking place during Pleistocene Age. The visible vertical rockbeds in the bare hill sides, particularly in the southern parts, are the result of intense folding activities.

Physiography

Being part of the Himalayan mountain system in general, the topography of Arunachal Pradesh reflects major features of this young fold mountain-chain. A cursory look on the relief map (Fig.1) suggests predominance of the west-east length over the north-south extension. Despite the presence of many drainage systems, more than 70 per cent geographical area is above 1,350 metres (above the msl). A meaningful description of the altitudinal variation could be attempted by moving west to east and from north to south. There is gradual decline in altitude from the west to the east (cf. Table 1). The longitudinal (erosional) valley, east of the river Bhorali, and numerable ridge-like features are prominent in the west. Beautiful step-like relief variation is found eastward and formation of deep gorges by Subansiri and Kume rivers in their upper parts. Further, east is characterised by the antecedent drainage of Tsang Po (which is called Siang in Arunachali part and then, Brahmaputra in Assam), alongwith its upper stage tributaries, seemingly makes the configuration conspicuously complex. To the east of Abor hills, the Siang forms depositional plain running in northwest-southeast direction. This funnel-shaped plain opens out in the southeast to merge

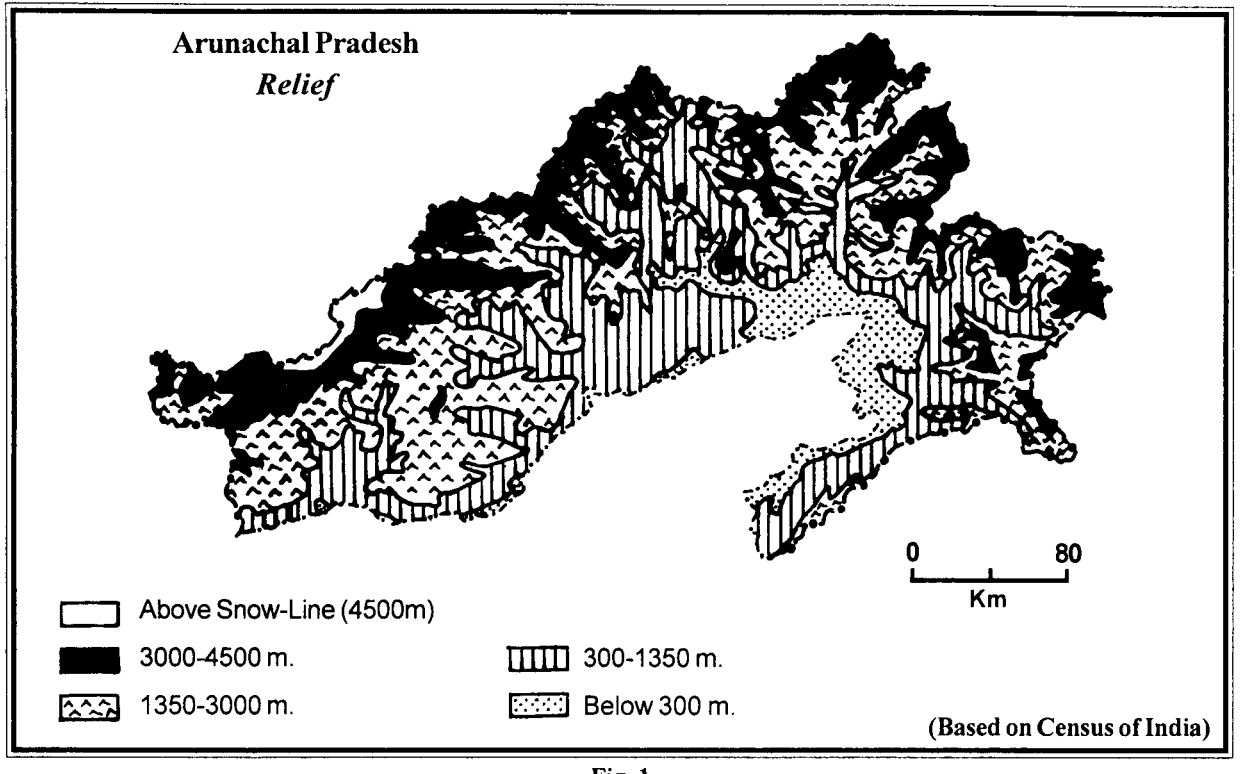
Arunachal Pradesh
Relief
0
80
Km
Above Snow-Line (4500m)
3000-4500 m.
1350-3000 m.
300-1350 m.
Below 300 m.
(Based on Census of India)

Fig. 1

Table 1. Arunachal Pradesh: Major Mountain Peaks

Sl. No.	*Peak/District*	*Altitude (metre)*
1.	Kangto (West Kameng)	7,089
2.	Takpa Shiri (Lower Subansiri)	6,565
3.	Shalundi (Dibang Valley)	4,810
4.	Daphabaum (Changlang)	4,578
5.	Komdi (East Siang)	4,185
6.	Vorjing (Upper Subansiri)	3,989
7.	Ladu (Lower Subansiri)	3,041

Source: Based on relief maps of different sources.

with the plains of Dibang, Lohit, Nao-Dihing and Buri-Dihing like rivers and they together join the adjoining upper Assam plain. The south-eastern part of the state is separated from the rest due to its topographical affiliation to the Naga hills. Parallel hilly tracts could be seen extending northeast-southwest and the general slope is towards west. Following broad longitudinal sub-divisions may be identified in this region:

1. The Great Himalayan zone,
2. The Lesser Himalayas with high longitudinal valleys,
3. The Silver system and
4. The southern Arunachali plains.

Drainage

The role of rivers as an active agent, in sculpturing the topography, especially in humid regions needs no elaboration. Arunachal, being the region which receives an average annual rainfall exceeding 200 cm mark, is entirely covered by the rivers' network (Fig. 1). As a general rule almost all rivers, of different orders, are consequent upon the slope with the exception of Siang (also known as Dihang and Brahmputra) and Lohit, examples of antecedent drainage. These rivers have cut through the Sivaliks sufficiently. As far as the drainage pattern is concerned, all river regimes reflect the character of dendritic pattern. The rivers have been considered important in defining sub-regions; probably, due to this fact the administrative

Table 2. Arunachal Pradesh: Major River Systems

Sl. No.	*River System*	*Main River*	*Important Tributaries*
1.	Kameng System	Kameng (also called Bhorali)	Pochuk, Pacha, Papu, Bichom
2.	Subansiri System	Subansiri	Sigin, Kamala, Kale, Papum Pare, Siken, Sinyum, Syee
3.	Siang System	Siang (or Dihang)	Ringong, Singong, Nidgong, Shimong, Siyom, Arpong, Yamne, Siku, Sibia, Sessari
4.	Dibang System	Dibang	Matun, Dri, Emra, Tangon, Ahi, Ithun
5.	Lohit System	Lohit	Delei, Dav, Tidding, Digaru, Balijan, Hetzu, Satti Lati, Belang Kamlang, Nao Dihing, Tenga Pani

Source: Based on Census of India, 1988.

divisions are still named after the important rivers, barring a few execptional cases. The prominent river systems are summarised in Table 2; however, one river called Dikrang does not belong to any of these systems as it flows independently into Brahmaputra from the north. To the south of Lohit river system, smaller rivers exist. Important among being Buri Dihing or Namphuk, Tirap and Tissa. Almost all of these have respective source in the Patkai hills, a major watershed.

Climate

Broadly speaking, Arunachal Pradesh falls into the sub-tropical climate zone. The excessive rainfall and moderately high temperature conditions give the climate here a humid meso-thermal character. The major climate controls, in the case of Arunachal, are the orographic features, predominant maritime airmasses (of Bay of Bengal), pressure cells and periodic western disturbances and the local wind movement.

The life cycle in Arunachal is neatly woven with the seasonal rhythm, as we find in the case of other agricultural regions in India and elsewhere. The people here have still a very close bond with nature and hence seasons affect their activities in a decisive manner. On the basis of variable conditions four major seasons may be identified: pre-monsoon season (March to mid-May), monsoon season (mid-May to mid-September), post monsoon season (mid-September to November) and cold season (December to February). Nevertheless, rainfall is experienced round the year with intermittent dry spells. Since higher precipitation is part and parcel of Arunachal, none of its parts are arid or semi-arid. But, relatively longer dry spells, especially in the high mountains where all water sources are rain-fed, create somewhat drought-like situation occasionally. One may identify distinct zones of precipitation as it varies across the state (cf. Fig. 2):

1. very high precipitation zone (above 400 cm)
2. high precipitation zone (300–400 cm)
3. moderately high precipitation zone (200–300 cm)
4. low precipitation zone (100–200 cm)
5. very low precipitation zone (below 100 cm).

These precipitation zones form a pattern of concentric circles around southern part of Mariyang sub-division of the Upper Siang district with the highest rainfall *i.e.* above 500 cm. The annual variation in rainfall is insignificant in the case of Arunachal; however, significant seasonal variation is noteworthy. The southern parts of the state receive about 70 per cent of the annual rainfall during the southwest monsoon season, around 20 per cent in the pre-monsoon months and the rest in the other months. The northern parts receive approximately 55 per cent of rainfall through the southwest monsoon and nearly 20 per cent each in the pre-monsoon and winter season.

As far as the distribution of temperature is concerned, seasonal and spatial variations are clearly discernable. It is relevant to observe here that metereological recording system is quite new except at Pasighat for which informations are available for somewhat longer period. Hence, due to lack of sufficient data, detail comments on thermal conditions are difficult to make. Elevation plays important role of the thermal regulator here, as attested by existing temperature

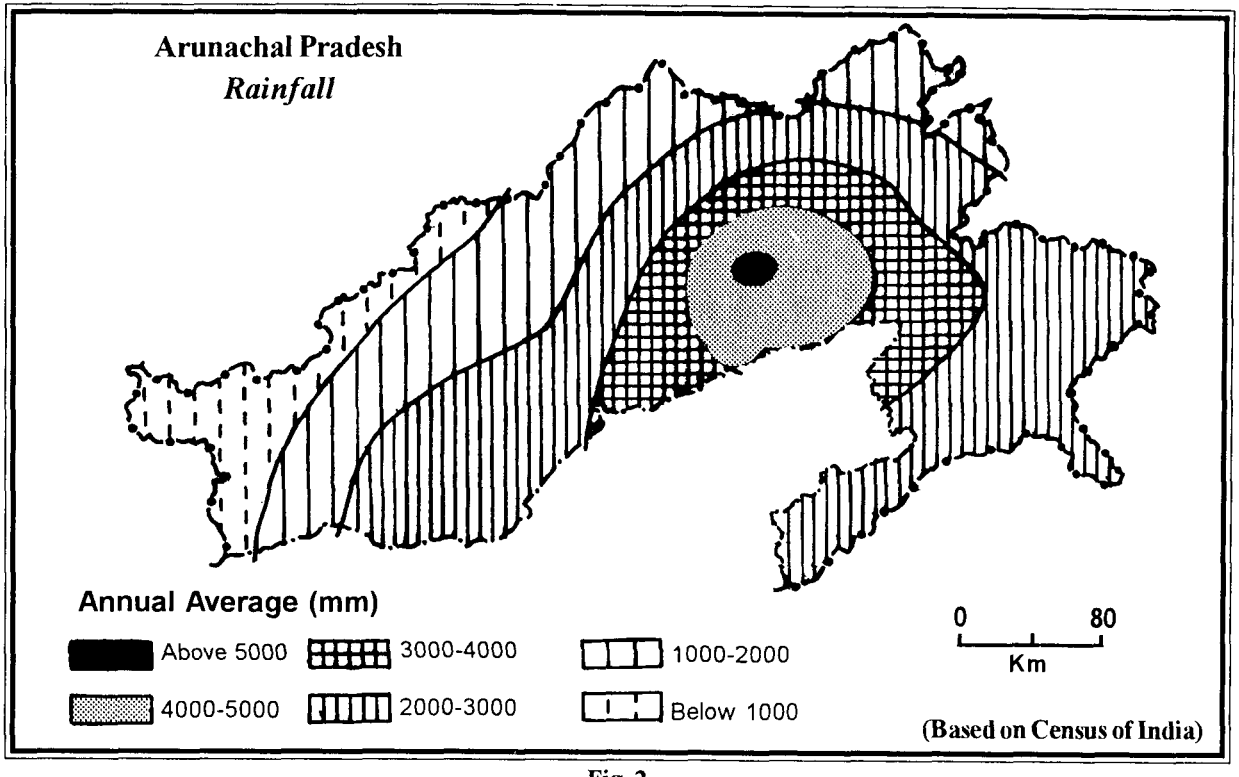
Arunachal Pradesh
Rainfall
Annual Average (mm)
Above 5000
3000-4000
1000-2000
4000-5000
2000-3000
Below 1000
0
80
Km
(Based on Census of India)

Fig. 2

anamolies. As a result, the foothills and riverine plains experience higher temperature (*e.g.* Tezu 38° C) than places located in higher altitude (*e.g.* Bomdila 18° C) in the same summer season.

On the basis of precipitation and temperature variations across Arunachal Pradesh, one can identify three broad climate regions:

1. The sub-tropical (hot-humid) foothills and the southern riverine plains,
2. The moderate thermal region of the inner Himalayas and
3. The alpine climatic region of the great Himalayas.

The Resource Base

Our existence and survival depend upon the (natural) resources. The natural resource endowment varies inter-regionally as well as intra-regionally. General development and the development of resources are closely linked and have a reciprocal relationship. This section is an attempt to present a precise account of the resource availability in Arunachal Pradesh. It covers soils, hydrological resources, forest resources, mineral resources and the human resources.

Soil

Any soil is a dynamic natural complex of minerals and biotic elements. It has the capacity to produce and sustain plant life. There are three broad essential constituent minerals in soil: mass minerals (*e.g.* oxygen, silicon, aluminium and ferrous elements), primary nutrient minerals (*e.g.* nitrogen, calcium, phosphorus, and potassium) and secondary nutrient minerals (*e.g.* sulphur magnesium *etc.*). Beside the nutrient minerals, humus—the biotic elements are essential components of soil and they enhance soil fertility.

Soil is the most important natural resource, particularly for the farming communities and those depending on forests. Following main characteristics with respect to the soils of Arunachal Pradesh may be mentioned:

1. Soil in this region lack well-developed 'soil-profile', except small patches of alluvium, indicating that larger parts are covered by new soils.

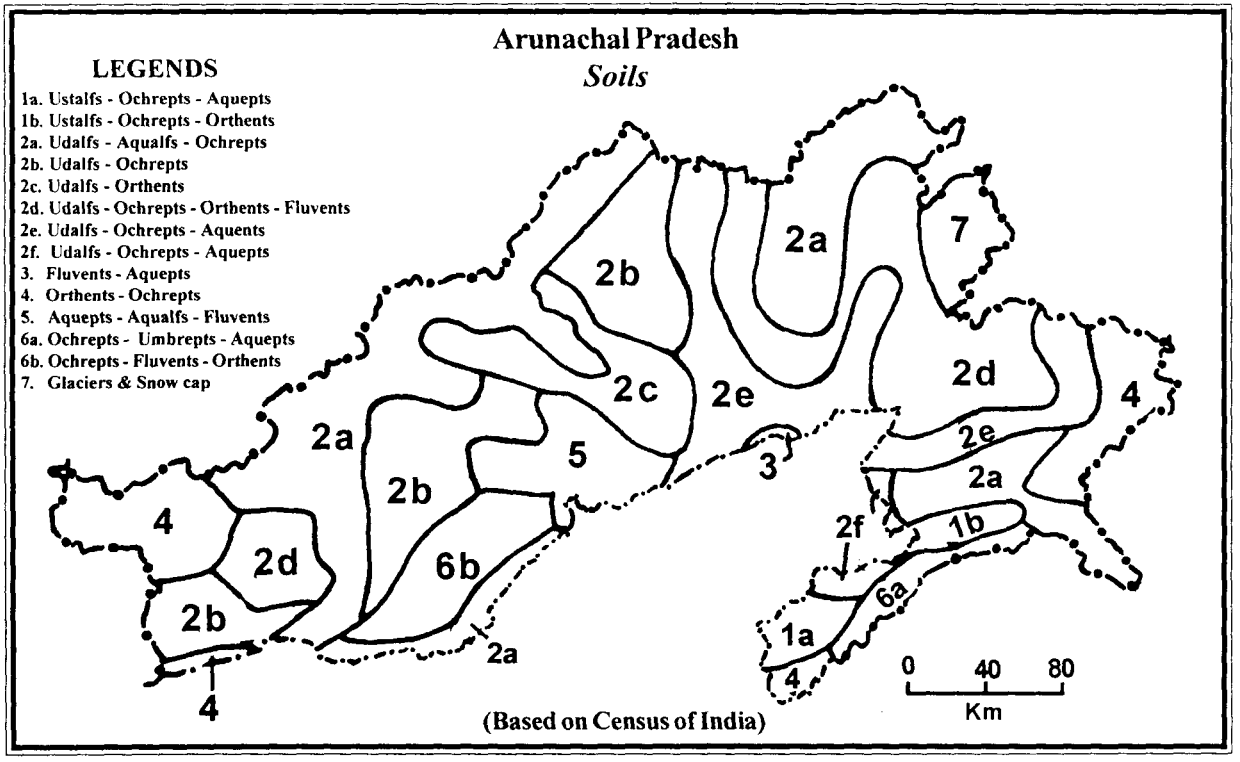
Arunachal Pradesh
Soils
LEGENDS
1a. Ustalfs - Ochrepts - Aquepts
1b. Ustalfs - Ochrepts - Orthents
2a. Udalfs - Aqualfs - Ochrepts
2b. Udalfs - Ochrepts
2c. Udalfs - Orthents
2d. Udalfs - Ochrepts - Orthents - Fluvents
2e. Udalfs - Ochrepts - Aquents
2f. Udalfs - Ochrepts - Aquepts
3. Fluvents - Aquepts
4. Orthents - Ochrepts
5. Aquepts - Aqualfs - Fluvents
6a. Ochrepts - Umbrepts - Aquepts
6b. Ochrepts - Fluvents - Orthents
7. Glaciers & Snow cap
0 40 80
Km
(Based on Census of India)

Fig. 3

2. The leaching process is ubiquitous due to high rainfall and hence soil acidity is much higher than the optimal level.
3. Despite fresh addition of humus in large volume by vegetal cover, the effective humus layer is very thin due to washing off effect of widespread surface run off.
4. There is visible local level variation in soil structure and texture.

The National Bureau Soil Survey and Land Use Planning (NBSSLUP, Nagpur), a constituent unit of the ICAR, identifies nine soil types in Arunachal Pradesh as below:

1. Ustalfs (high base status and red loamy, red sandy and alluvial soils)
2. Ochrepts (shallow black, brown and alluvial soils of northern regions)
3. Aquepts (hydromorphic brown soils)
4. Orthents (recently formed soils)
5. Aqualfs (hydromorphic high base status soils)
6. Udalfs (high base soils of humid regions)
7. Aquents (recently formed hydromorphic alluvial soils)
8. Fluvents (recent alluvium)
9. Umbrepts (red and yellow forest soils).

It is mentionworthy that none of the above mentioned soil types occur independently. They are evidently found in sub-order associations (see Fig. 3). This fact indicates micro-level variation of high degree.

There are two problems of soil—soil erosion and loss of soil fertility. The former among these is caused due to rash deforestation and unscientific methods of cultivation, and has multiple consequences impeding development, the sustainable development. Specific programmes to check it and the associated problems were introduced here during the Fourth Five-Year Plan Period (1969–1974). Currently, this problem is being taken care of as part of watershed management by the department of rural works. The general methods prescribed for soil conservation include application of essential nutrients, covering land with plant crops (and their residue) to check sheetwash, horizontal/contour ploughing, terracing, crop-rotation *etc.*

Hydrological Resources

'Water is life' and it is going to be one of the most scarce and threatend resources in the near future. The term 'hydrological resources' is a blanket term used and it includes surface water and ground water. There are three direct and commercial/economic uses of water—irrigation, hydel power generation and pisciculture. In general practice, estimation of water availability is based on the function of annual rainfall and annual run-off. The annual run-off is calculated on the basis of water discharge estimates of the rivers in a region. In Arunachal Pradesh, despite heavy annual rainfall availability of (surface) water is insufficient in the higher hills and mountain areas. This further deteriorates in the drier spells. Storage facility for excess water is negligible. Exploitation of ground water is an alternative for the small plains only. Ponds have been constructed but not used for drinking or irrigation purposes. They are meant for pisciculture alone. Canal irrigation is developed in a very limited area (cf. Table 3). Immense potential for hydel power generation exists

Table 3. Arunachal Pradesh: Area Under Canal[1] Irrigation (ha.)

Sl. No.	*District*	*Area*
1.	Tawang	325
2.	West Kameng	135
3.	East Kameng	372
4.	Papum Pare	190
5.	Lower Subansiri	188
6.	Upper Subansiri	152
7.	West Siang	450
8.	East Siang[2]	1,013
9.	Dibang Valley	160
10.	Lohit	580
11.	Changlang	239
12.	Tirap	100
	Total	3,904

Notes: 1. Here government canals only are included.
2. It includes Upper Siang district too.

Source: SAAP.

here. Currently, hydel power generation in Arunachal is done mostly by the mini/micro hydel plants. The power generated is consumed entirely at the local level.

Forests Resources

The forests are one of the three common property resources (CPRs) in the Arunachali village society. Nearly 62 per cent of the total geographical area is covered by forests here (cf. Table 4). Forests cover in itself is an index of environmental health and has a crucial role in influencing climate. The (rural) life of an average Arunachali is traditionally attached so strongly to the forests that it seems difficult to imagine life without forests here.

The forests of Arunachal Pradesh could be broadly categorised as: (1) the tropical wet evergreens, (2) the tropical semi-evergreens, (3) the East Himalayan sub-tropical wet forests, (4) the East Himalayan moist temperate forests and (5) the Alpine forests. Forests

Table 4. Arunachal Pradesh: Forests Area

District	*Geographical Area (Km^2)*	*Forests Area (Km^2)*	*Forests Area as percentage to total area (%)*
West Kamang[1]	9,594	4,946	51.55
East Kamang	4,134	2,129	51.50
Lower Subansiri[2]	13,010	6,637	51.01
Upper Subansiri	7,032	3,618	51.45
West Siang	12,006	10,487	87.35
East Siang[3]	6,512	5,123	78.60
Dibang Valley	13,029	8,160	62.63
Lohit	11,402	7,145	62.66
Tirap[4]	7,024	3,235	46.06
Total	83,743	51,480	61.55

Notes: 1. It includes Tawang district.
2. It includes Papum Pare district.
3. It includes Upper Siang district.
4. It includes Changlang district.

Source: Compiled by the author.

Table 5. Arunachal Pradesh: Classified Forests

Sl. No.	*Forest Classification*	*Area (ha.)*
1.	Reserved Forest	9,552.32
2.	Anchal/Village Reserved Forest	625.37
3.	Protected Forest	7.80
4.	Forest under Wildlife Sanctuary	2,468.24
5.	Forest under National Park	3,827.83
6.	Unclassified State Forest, USF	31,757.38

Source: Based on *SAAP* volumes.

are also classified as illustrated in Table 5. On the basis of economic value of different items obtained from forests, they are simply grouped as 'major' and 'minor' forest products. The major products include timber and firewood; and the minor products are bamboo, cane, wild vegetables—fruits, herbs *etc.* (see Appendix 10 for details).

Minerals Resources

Incomplete geological survey of the state mainly due to the harsh terrain and poor accessibility reasons is the root cause of inadequate exploration for the minerals. The limited explorations conducted till date indicate potential availability of a few mineral resources; but, their commercial exploitation is doubtful. The proved main reserves of coal, petroleum and natural gas, graphite, limestone, marble stones, and dolomite (of high grade) give hope for the future. Other minerals known to be existing in stray minor patches are iron-ore, sulphides, chalcopyrite (with malachite), copper and cobalt.

Human Resources

In the discussion of resources human beings, become important on several accounts. As makers of culture and the producer-consumer of resources, humans automatically become the greatest resource. The total population of 10,91,117 persons (2001) could be further disaggregated as over 60 per cent tribals and around 35 per cent non-tribals; over 80 per cent rural and 13 per cent urban, and so on. Thirty one communities are identified as permanent inhabitants (cf.

Appendix 2) and majority of them are again disaggregated into sub-tribes and clans. Considerable variation in terms of their socio-cultural practices is found. Diversity in ethnic composition could be better captured with respect to linguistic aspect. Forty-two languages and sixty-one dialects of all variations are spoken. With the exception of Assamese, English, Hindi and Nepalese; all languages belong to Tibeto-Chinese language family. It will not be out of place to mention Nefamese—a comfortable linguistic mixture of a tribal language of Arunachal and Assamese. It serves as the lingua-franca in the course of interaction(s) between tribals and Assamese. On top of that six scripts, *viz.* Devanagari, Assamese, Hingna, Mon, Roman and Tibetan are in simultaneous use. This poses a challenge to the education system and use of English as the medium of instruction is nothing but a compulsory choice. The people profess indigenous faith, Christianity, Buddhism and some variants of Hinduism (*e.g.* Vaishnavism).

Table 6. Arunachal Pradesh:
Trend of Crude Population Density (per Km^2)

Year	1961	1971	1981	1991	2001
Density	04	06	08	10	13

Source: Census of India Reports.

The population growth has been very sluggish and naturally the population density is very less as illustrated in Table 6. A very poor situation is evidently found in the field of literacy. In comparision to other north-east India states, Arunachal Pradesh carries the burden of greater percentage of illiterate persons (see Appendix 11). Naturally, it has wider implications when human resource problem is analysed. The poor condition of the people here is further attested by the very low values of economic, agricultural, and physiological densities worked out in Appendices 12 and 13.

Conclusion

Evolution of Arunachal Pradesh as a full state has been steady but slow. Very recent achievement in this regard is the starting up of a functional branch of Honourable Guwahati High Court at Itanagar.

It is appropriate to note that there is lack of sufficient studies on many aspects of land and people of Arunachal. That is the reason why the geological structure of this part of India is still not known in complete manner. Naturally, this situation does not encourage minerals' exploration. The physiography is highly undulating with the predominance of hills and mountains. This challenge is made further difficult by the presence of numerable streams and many perennial rivers. Climatic conditions vary considerably with the variation in altitude. By and large the resource base is quite limited. Forests are the main resource and big potential for hydel power generation exists. As per the 2001 census, 10,91,117 persons live in Arunachal Pradesh. Though man-land ratio is favourable but the general population do not have required resourcefulness, which could be utilised to bring in desirable economic transformation and development in Arunachal Pradesh.