

Peopling of India, the growth and distribution of population and its composition, the types of human settlements and house-types have been discussed to help the student understand the social diversity in India. It is interesting to note that an underlying unity provides the base and sustains the varying regional patterns forming a complex composite Indian nation.

An earlier edition of this textbook in English was authored jointly by Late Professor Moonis Raza and Professor Ajazuddin Ahmad. This textbook was translated into Hindi by Dr.M.H. Qureshi. These were published by the NCERT in 1990.

In view of the availability of the 1991 Census data on population as well as the comments and suggestions received from experts, teachers and students, the need for a thorough revision of the book was felt. The NCERT is grateful to Professor Ajazuddin Ahmad for preparing the new revised edition of this textbook. I am also thankful to Dr. (Mrs.) Nasim Ajaz who has not only helped in the revision of the textbook but has also taken up the task of rendering this book into Urdu.

A large number of maps and diagrams have been taken from the earlier version, which were prepared by Shri Ashok Malik, Shri Zohair Anwar and Shri Akhilesh Mathur. Some of the maps (Figs. 25, 26, 27, 28 and 30) have been prepared on the computer by Dr Md. Shainul Haque. I am thankful to all of them. The NCERT is also indebted to Professor S. Nangla, who provided computer facilities of the Centre for the Study of Regional Development, Jawaharlal Nehru University.

I am thankful to my colleague Professor Savita Sinha for her contribution at all stages in the finalization and publication of this volume as well as for preparing the Hindi version of the book. Dr Basabi Khan, Banerjee helped in the finalization of the manuscript in English. Dr. Mohammad Shainul Haque helped in the preparation of the press copies of English and Hindi versions. I am grateful to both of them.

The NCERT would welcome comments and suggestions on any aspect of this textbook.

New Delhi

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THE CONSTITUTION OF INDIA

PREAMBLE

WE, THE PEOPLE OF INDIA, having solemnly resolved to constitute India into a
(SOVEREIGN SOCIALIST SECULAR DEMOCRATIC REPUBLIC) and to secure to all its citizens:

JUSTICE, social, economic and political;

LIBERTY of thought, expression, belief, faith and worship;

EQUALITY of status and of opportunity;
and to promote among them all

FRATERNITY assuring the dignity of the individual and the (unity and integrity of
the Nation);

IN OUR CONSTITUENT ASSEMBLY this twenty-sixth day of November, 1949, do
HEREBY ADOPT, ENACT AND GIVE TO OURSELVES THIS CONSTITUTION.

1. Subs. by the Constitution (Forty-second Amendment) Act, 1978, Sec.2, for "Sovereign Democratic Republic"
(w.e.f. 3.1.1977)
2. Subs. by the Constitution (Forty-second Amendment) Act, 1978, Sec.2, for "Unity of the Nation"
(w.e.f. 3.1.1977)

Part IV A Fundamental Duties

ARTICLE 51A

Fundamental Duties - It shall be the duty of every citizen of India-

- (a) to abide by the Constitution and respect its ideals and institutions, the National Flag and the National Anthem;
- (b) to cherish and follow the noble ideals which inspired our national struggle for freedom;
- (c) to uphold and protect the sovereignty, unity and integrity of India;
- (d) to defend the country and render national service when called upon to do so;
- (e) to promote harmony and the spirit of common brotherhood amongst all the people of India transcending religious, linguistic and regional or sectional diversities; to renounce practices derogatory to the dignity of women;
- (f) to value and preserve the rich heritage of our composite culture;
- (g) to protect and improve the natural environment including forests, lakes, rivers, wild life and to have compassion for living creatures;
- (h) to develop the scientific temper, humanism and the spirit of inquiry and reform;
- (i) to safeguard public property and to abjure violence;
- (j) to strive towards excellence in all spheres of individual and collective activity so that the nation constantly rises to higher levels of endeavour and achievement.

CHAPTER I

India : The Locational Setting

Introducing India

INDIA, our homeland, is a great country both in terms of its geography and history. Its size is so vast that it is often described as a 'sub-continent', part of the Asian continent and yet looking like a continent in itself. It sprawls between the snowy heights of the Himalaya and the shores of the Indian Ocean, which washes the land for thousands of kilometres from the delta of the Ganga in West Bengal to Kachchh in Gujarat, a little to the east of the mouth of the Indus. The land encompasses the vast expanses of the northern plains, the sands of the Thar on the west, Indo-Myanmar hills on the east, the uneven plateau surface, the ancient hills and the coconut producing coastal plains on the south, and the lofty, snowcapped mountains on the north. The country gets an abundance of sunshine from the tropical sun and moisture from the splashing monsoon rains. The two elements together exerting a tremendous influence on the destiny of its teeming millions. This is India, our homeland, the dispenser of our destiny with remarkable continuity, defying time, and still changing like the patterns in a kaleidoscope.

The Kaleidoscope of Time

Let us peep into this kaleidoscope of time and get glimpses of these changing

patterns. The food gatherers of the Stone Age, haunted by the spirits of the jungle, are crouching in fear and leading a life of complete obeisance to nature. The early Neolithic communities are turning the soil with their stone hoes, worshipping the Mother Earth, which produces the riches of plants and a variety of animals and thus sustains life.

The iron smelting Aryans are singing hymns to the forces of Nature but at the same time are learning to control them, taming rivers and giving shape to the shapeless clay. Clinging to the rivers, which deposit every year a layer of fertile alluvium, these early peasant communities are living in villages, big and small, witnessing in their calm tranquillity the rise and fall of empires in the sprawling cities on the banks of the Ganga, the Yamuna and the Kaveri.

Surrounded by the vast ocean of humanity, living in tiny little hamlets, you may find a number of cities like islands. In dingy workshops, the artisans and handicraftsmen are putting life into dead stones, fashioning ornaments from glittering gold, weaving patterns from multi-coloured cotton and silk threads.

Move your hand and you get a new pattern in the kaleidoscope. Smoke is coming from the chimneys; molten brown metal obtained from the ore is being transformed into blue steel; the turbulence

of restless waters is being harnessed; pylons rise in serried ranks, like symbols of man's understanding and control over the forces of nature.

At every stage in this march through the corridors of time, we have leaned heavily on nature. In the beginning we were almost its slaves. Slowly but steadily we learnt to understand nature and cooperate with it. We are now increasingly interacting with it with the help of the knowledge of science and technology at our command. We can effectively interact with nature only to the extent we understand it. We can neither defy nor ignore it for we are its children, being nurtured in its lap and dependent on it for our very existence.

The general direction of our development is largely influenced by the opportunities offered by nature. It provides the broad framework of development. It tells us certain directions to get the best results. In order to usher in an era of plenty for our people we should listen to this advice.

We should learn to use the natural resource endowment in a rational way. We should not be too greedy to exhaust it very soon, nor use it excessively and leave behind the wasteland. These resources should be used rationally and according to the laws of nature. We should also understand that the resources have to be conserved for the coming generations. We should realise that we are not the owners of these resources, we are only their custodians.

Space Relations

The globe shows the Indian sub-continent as the southward extension of the great landmass of Asia. The Indian Peninsula tapers towards the Indian Ocean, dividing the ocean into the two flanking expanses of water, known as the Arabian Sea and the Bay of Bengal. The two seas wash the

western and the eastern coasts of India, respectively yielding a bounty of fish to the people in the littoral regions.

The sea has played an important role in determining the nature of interaction of the Indian people with those of the surrounding regions in Africa, South-west and South-east Asia. At times, the sea has offered easily negotiable communication links between India and the Peninsulas and the archipelagos of South-east Asia and the littoral countries of West Asia and East Africa. At other times, these water bodies have also acted as barriers imposing a certain degree of isolation and restricting human interaction. The connecting role of the water bodies is seen in the cultural influences of India getting diffused into the distant lands to the west and the east. It is also reflected in the assimilation of new cultural elements coming from its maritime neighbours into the Indian society adding a new flavour and richness to it. On the other hand, the sea has promoted a certain degree of isolation and has fostered a unique homogeneity in the Indian civilization.

On the north, an unbroken chain of lofty mountains girdles the landmass without any break for thousands of kilometres, practically walling it off the trans-Himalayan Asia. It is because of the formidable nature of the mountain chain that all approaches to India from the North-east and the North-west have been beset with great difficulties. The net result is that communication between us and those living in Tibet and Central and West Asia has been possible only through a few passes which are themselves located at high altitude. This emphasises the partially enclosed character of the sub-continent, a feature which has played a great unifying role in strengthening the uniqueness of our people.

India occupies a fairly large area on

the globe. In size it is one of the largest countries of the world, spread over an area of 3.2 million square kilometres. But there are countries far larger in size than India. The USA is about three times as large as India.

India is situated in the Northern Hemisphere. The southern tip of the peninsula just misses the Equator only by a few degrees. The Tropic of Cancer passes approximately through the middle region of the country. The northern-most fringe of India consists of a mountain system which radiates from the Pamirs, the roof of the world, in the heart of Asia. The hot and humid Kanyakumari constitutes the southern-most tip where the Indian peninsula, getting narrower and narrower, loses itself into the ocean. If one were to travel from the northern-most to the southern-most points in the mainland of India, one would cover a distance of about 3,200 kilometres. About 30 degree of latitudinal extent is covered by this distance which is one-third the angular distance between the Equator and the North Pole.

East to west, India covers almost the same distance as it does north to south—approximately 3,000 kilometres. Its western-most point lies on a creek in the salty marshes of the Rann of Kachchh. On the other hand, where the realms of Myanmar, China and India meet and where the virgin forests and untrampled hills still slumber in their primeval majesty, there lies the eastern-most point of India. The east-west extension of India covers almost 30 degree of longitude roughly equalling the longitudinal extent of Spain, France, Germany, Belgium, Netherlands and Poland combined—which is one-twelfth of the Earth's circumference at the Equator. When the sun has already risen in Arunachal Pradesh, it is still night in Saurashtra and only after two hours the

sturdy Kathiawar peasant will rub his eyes and greet the earliest rays of the sun.

So vast and extensive is our motherland. In the age of jets, however, distance has lost its old significance. You can have breakfast in Srinagar and lunch at Thiruvananthapuram on the same day; and a journey between Jamnagar and Guwahati may be completed within the time taken by a Hindi film show of three hours duration.

India and the Oriental World

Let us look at a map showing the Orient. The Indian Ocean washes the eastern coast of Africa and Southern coast of Asia. It was on its waves that the boats of the Babylonians, the Egyptians and the Phoenicians sailed in days of yore. The Arabs carried on their trade through its sea lanes. Indian boats and ships have been sailing in this ocean for at least 4,000 years, taking merchandise to the valleys of the Euphrates, the Tigris and the Nile, carrying ideas to Bali and transporting our architectural styles to Cambodia and Indonesia. (see Fig. 1)

Indeed, the Indian Ocean unites the Oriental world consisting of East Africa, West Asia, and South and South-East Asia. With the opening of the Suez Canal, the Mediterranean has been linked with the Indian Ocean and Southern Europe and North Africa have been brought within the sphere of our direct influence.

India occupies an eminent position in the Indian Ocean realm. No other country has such a large coastline flanking the Indian Ocean. The Deccan Peninsula projects itself into the Indian Ocean thus making it possible for India to look both ways—towards West Asia, Africa, and Europe from the west coast and towards South-East Asia and the Far East from its east coast. Other countries, except Sri Lanka, bound the Indian Ocean. India

is in it. The Indian Ocean is truly Indian.

The ocean became a unifying force quite late in history. But space relations on the land surface have been of significance from the dawn of history. In order to understand them, let us have a careful look at the map of India. To its north and the north-west, mountains rise almost like the ramparts of a fort. It would appear that this almost impenetrable wall would have cut us off from the regions lying to the north. But this is an illusion. A physical map with its shades of green and brown and dark brown is sometimes quite misleading. Mountains can stop the onward march of the winds. But men find openings here and there—passes, gorges, river valleys. Ideas and institutions, reformers and soldiers, artists and handicraftsmen have been coming and going along these routes. The heights of the solitary peaks remain unperturbed. Hordes of pastoral nomads entered the fertile valleys of India along these lines of access. Buddhist *Bhikshus* crossed into Tibet and went further on to China, Korea and Japan with their message of peace. The Prince of Macedonia brought his armies into India; the beauties of Greek sculpture came in its wake. Indian merchants, with their caravans, crossed these barren heights to establish trade links with Central Asia. Afghanistan and Iran; the stories of Panchtantra went along with them. Mongols, Turks, Arabs and Iranians came as conquerors but settled down in this land bringing with them the simple beauty of the dome, the majesty of the minaret; taking back to their original homelands the Indian numerals, the decimal system and the ideas of the *Upanishads*. This exchange of ideas and commodities became possible only because our country was situated in close vicinity to the major highways of the ancient and the medieval world.

We have been and continue to be the central link in the chain which binds West Asia, East Asia, Central Asia and South East Asia. We have not been and cannot be an insular people. We cannot afford to live in a world divided by 'narrow domestic walls'. We are destined to be involved in mankind, destined to play a key role in bringing the nations together.

India's Neighbours

As in the case of all countries with an ancient civilization, the boundaries of India are mostly natural and historically determined. The marginal seas of the Indian Ocean form the boundary in the south giving India a coastline approximating in length the radius of the Earth. If one were to travel from New York to San Francisco one would cover almost the same distance. Separated by the Sea from the mainland are a number of Indian Islands—the Andaman and the Nicobar Islands in the Bay of Bengal and the Lakshadweep group in the Arabian sea. The nearest neighbour across the seas is Sri Lanka—the two countries are separated by the narrow Palk Strait. Across the eastern borders of India and the Bay of Bengal lie Myanmar (Burma), Malaysia, Indonesia, Thailand, Cambodia (Kampuchea), Laos and Vietnam. To the west are our West Asian neighbours—Pakistan, Iran, Iraq and the Arab countries. Further west across the Indian Ocean lie Egypt, Sudan, Ethiopia, Somalia, Kenya and Tanzania. The Maldives lie to the south of the Lakshadweep.

The Himalayan mountains guard our northern frontiers. Further north lie the Mustagh, the Aghil and the Kun Lun mountains adjoining the state of Jammu and Kashmir. Across the mountains lies the Sinkiang (Xinjiang) region of China—the Tarim Basin where once flourished the ancient civilization of Kashgar (K'ashih)

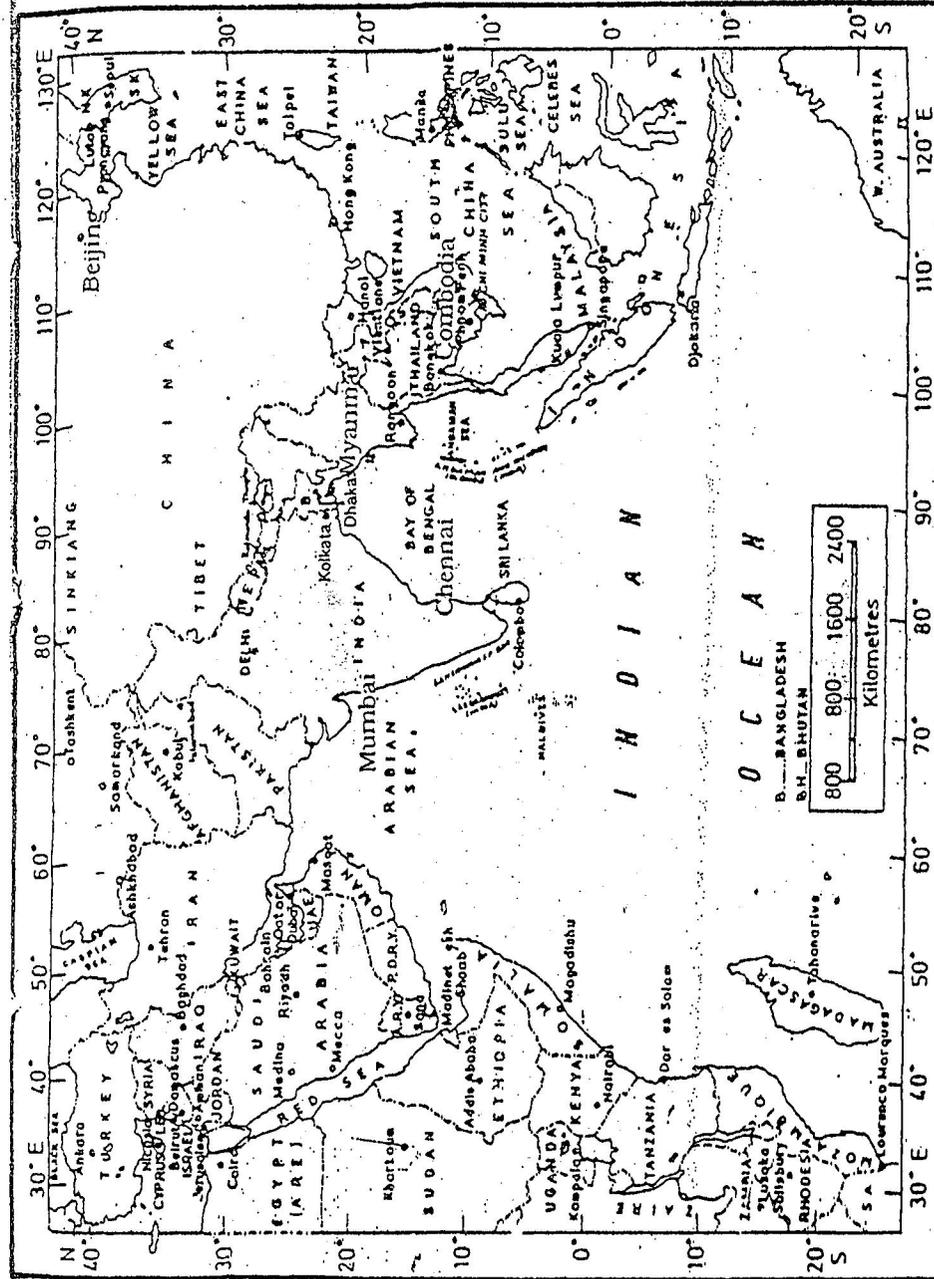


Fig. 1 India and the Oriental World

and Khotan (Hoteln). To the west of Sinkiang and separated from India by the narrow Wakhan territory of Afghanistan, is situated Tajikistan. As the boundary of India dips south in this region, it is adjoined by the land of hardy, freedom-loving Pathans. The apex of the North Indian triangle, viewed in this background, assumes great strategic significance. Here meet the five countries of Asia — China, Uzbekistan, Afghanistan, Pakistan and India.

Tibet, the land of the sacred Kailash and the Mansarovar stretches to the east and north of the Indian frontiers. Politically integrated with the Peoples Republic of China, Tibet has a long history of cultural and economic links with India. To our north lies the Himalayan Kingdom of Nepal. History and geography have combined to carve out a common destiny for the Indian and the Nepalese people. Fairly good roads connect India with Kathmandu. Common projects such as the taming of the rivers, like the Kosi, have further strengthened the bonds of cooperation and friendship between the two countries. Bhutan, famed for its scenic beauty is situated further east along our northern frontiers. We are bound together by special treaties. To the east of Bhutan, the crest of the high Himalayas acts as the dividing line between India and China. Across this boundary line, known as the Mc Mahon Line, lies Tibet. Lhasa, its capital is within 300 kilometres of the Indian border. The Indian boundary stretches eastwards along the region of thick forests and complex mountainous terrain. Here lies the junction, where Myanmar, China and India meet.

The eastern boundaries of India are guarded by the offshoots of the Himalayan ranges. The almost continuous chain of hills and ranges consisting of the Mishmi, the Patkal and the Naga hills defines our

eastern borders. They are followed by the Barail range, the Lushai hills and, finally, the majestic Arakan Yoma. Across this ridge covered by lush tropical forests, Myanmar and India have their common borders. Mandalay, the focus of interior Myanmar is within 300 kilometres from our eastern borders.

So complex is the nature of the mountain wall, separating us from our northern and eastern neighbours, that large scale communication has not been possible in the past. Of course, there are tracks along which pilgrims have gone to the Kailash and the Mansarovar. But attempts to establish modern means of communication dates back only to the last century. The historic Hindustan-Tibet Road, now a fair weather road, takes advantage of the Saluj gorge. The Kashmir-Leh route is extended northwards to cross the high ranges at the Karakoram Pass. The third major line of access lies across a pass in Sikkim. With the development of air transport, however, the significance of this mountain rampart as a barrier has considerably diminished. Our northern frontiers have become alive for the first time in history. The mysteries of the Himalaya, which had hitherto attracted only the *Sanyast* or the eccentric explorer, are now being probed by the political strategist and the military expert.

New lines of political demarcation were superimposed on the map of the Indian sub-continent as a result of the partition of India in 1947. East Pakistan was carved out in the eastern zone. It, however, broke away from Pakistan and emerged as the Independent Republic of Bangladesh in 1971. The states of West Bengal, Assam, Meghalaya, Tripura and Mizoram have common frontiers with Bangladesh.

Our western boundary separates us from Pakistan, who shares with us a history which goes back to the days of

Mohenjodaro (Sind) and Harappa (Punjab), Kalibangan (Rajasthan). In the north, adjoining India is the land of the sturdy Pathans, the home of Frontier Gandhi. To its south, lies the land of the five rivers where the lilting tunes of the Heer and the Bhangra reverberate amidst golden fields of wheat as they do in the adjoining villages of Amritsar and Jalandhar. Further south, adjoining the desert sands of western Rajasthan lies Sind encompassing the Indus delta.

We have traditionally been a peace-loving people. Indian armies have rarely

marched in hordes into the lands of other people. Historians know of Indian temples in Cambodia, Buddhist manuscripts in Chinese monasteries and Indian merchandise excavated from long forgotten towns in Central Asia. But nowhere can they come across a monument commemorating Indian conquest. Indian history is the history of a people who have tried to live in peace with their neighbours. But we love freedom which we have wrested from the hands of a mighty colonial power. We also love to guard this freedom zealously.

EXERCISES

Review Questions

1. Answer the following briefly :

- (i) What is a subcontinent? Explain with reference to countries lying south of the Himalayan Mountain system in South Asia.
- (ii) Mention two geographical features which have played a great unifying role in strengthening the forces of homogeneity in the Indian people.
- (iii) Where does India rank in area among the countries of the world?
- (iv) State two pieces of evidence to show that India was once a strong naval power.
- (v) Name six of our immediate neighbours and six relatively distant neighbours.
- (vi) State two facts which have strengthened the bonds of cooperation between India and Nepal.
- (vii) Which part of the Indian territory is closest to Indonesia?
- (viii) What is the Mc Mahon line?
- (ix) Name the States and Union Territories which have common frontiers with Bangladesh.
- (x) Name four important passes across the Himalayan mountains.
- (xi) What is the importance of Suez Canal to Indian trade?

2. Make out correct pairs from the two columns given below :

- | A | B |
|---|-----------------|
| (i) The land in which the Kailash and Mansarovar are located | Tarim Basin |
| (ii) The region where the ancient civilization of Kashgar and Khotan flourished | Pamir |
| (iii) The roof of the world | Tibet |
| (iv) A place where three seas meet | Rann of Kachchh |
| (v) The salty marshes in the western part of India | Kanyakumari |

3. Give reasons why :

- (i) The abundant sunshine from the tropical sun and the splashing rains from the monsoons exert a tremendous impact on the distribution of population of India.
- (ii) The seas surrounding the shores of India have played a vital role in determining the nature of interaction of the Indian people with those of surrounding regions.
- (iii) When the sun has already risen in Arunachal Pradesh, it is still night in Saurashtra.

4. Give a brief account of the changing patterns of human activities in India in a historical perspective.

5. Trace the geographical factors responsible for the cultural influences of India getting diffused into the distant lands and for the assimilation of new cultural elements coming from outside India.

6. Explain how far India can be said to occupy the most central position in the Indian ocean.

Map and Practical Work

7. On the outline map of India, show the following :

- (i) Important sea and air routes touching or passing through India.
- (ii) Countries bordering India on the north.
- (iii) Major sea-ports.

8. On an outline map of the Indian sub-continent show the following:

- (i) Bolan, Khyber, Nathula and Shipki La Passes.
- (ii) Three rivers having their sources beyond the Himalayas.
- (iii) The closest island neighbour.
- (iv) The southern-most point of India.
- (v) Highest peak in Peninsular India.

CHAPTER 2

Relief and Drainage

THE LAND SURFACE consists of diverse features anywhere in the world and India is no exception. The surface features take their form as a result of the action of internal and external forces of the Earth. These forces operate independent of each other. The land of India is characterised by great diversity in its relief and drainage. The north has a vast expanse of rugged topography consisting of series of mountain ranges, their peaks capped by eternal snow. These mountain ranges flank longitudinal valleys and plateau surfaces, displaying a vast variety in human life and culture ranging from the Nagas in the north-east to the Ladakhis in the north-west. The Himalaya link these diverse culture-groups in a thread which runs invisibly all along the mountain range. The towering mountain ranges of the north overlook the great Indo-Gangetic Plain, stretching from sea to sea and drained by the mighty streams, such as the Indus, the Ganga and the Brahmaputra. These rivers have played an important role in the emergence and sustenance of the early civilizations. They have also contributed significantly to the cultural ethos of the Indian people. The North Indian Plain is an area of level and low relief and its comparatively uniform surface is as impressive as its vast extent. Towards the south, the Plain merges with the

Peninsular Plateau made up of highly denuded rocks. The Plateau rises in a series of scraps which in some areas are arranged like a staircase and in others they stand like a steep wall. The Plateau, initially quite extensive in central India tapers towards the south acquiring its essential Peninsular form. Towards the sea-front the Plateau is skirted by coastal plains. Interspersed with trough like valleys of the Peninsular rivers, low mountains and rings of hills made up of resistant rocks which have survived the successive phases of erosion, the Peninsular Plateau has a large variety of relief. (see Fig. 2).

Three-fold Physiographic Divisions

At the macro level India may be divided into three broadly defined physiographic units :

- (i) The Himalayan mountain chain;
- (ii) The North Indian Plain; and
- (iii) The Peninsular Plateau

The Himalayan mountain chain consists of a series of parallel mountain ranges with bold relief and are characterised by highly rugged topography. They were formed by earth movements which affected the relief of the earth in the last phase of its geological history. Because of their young age which is evident from the striking contrast in relief, Himalayan

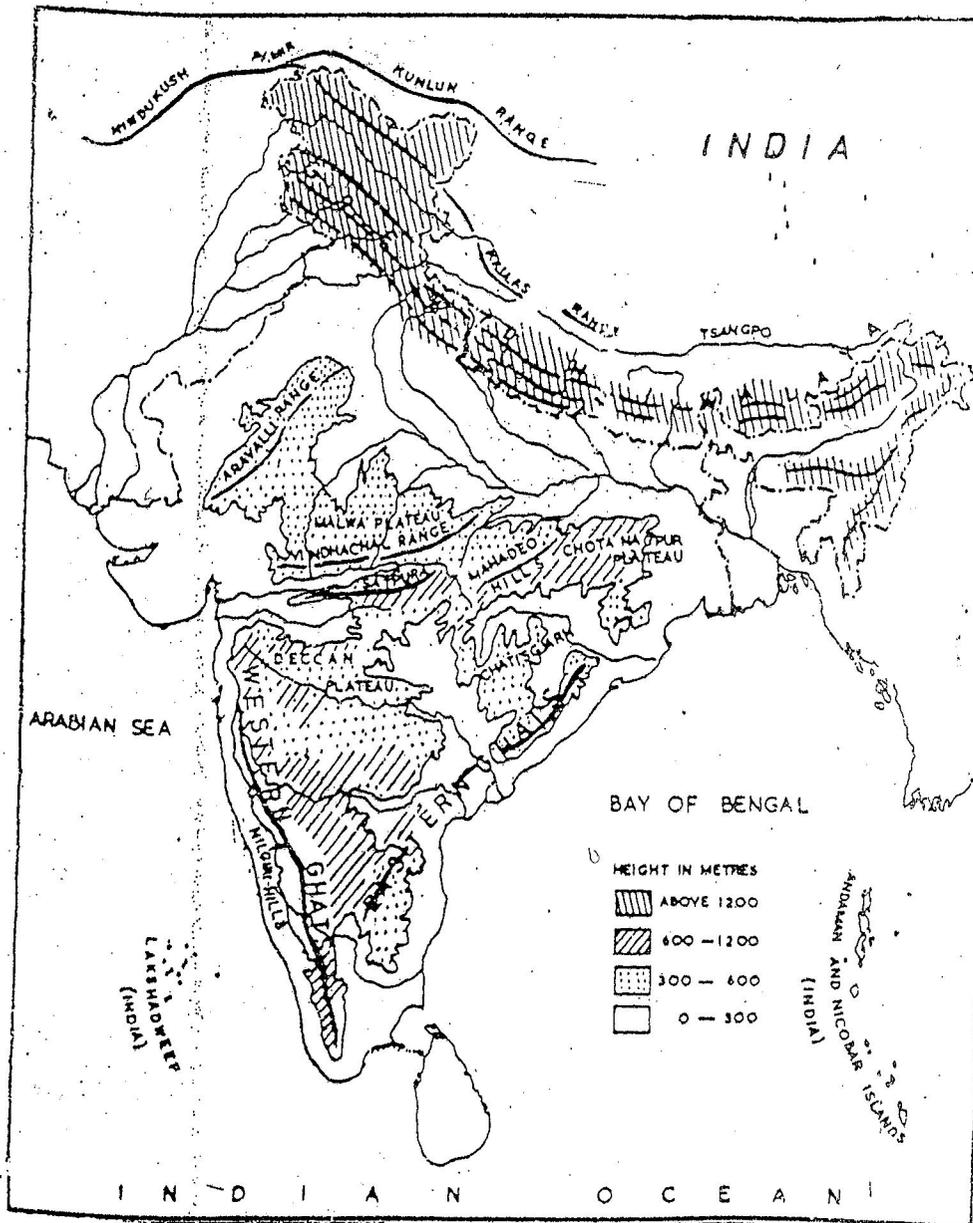


Fig. 2 India: Relief

Based upon Survey of India map with the permission of the Surveyor General of India.
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 The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.

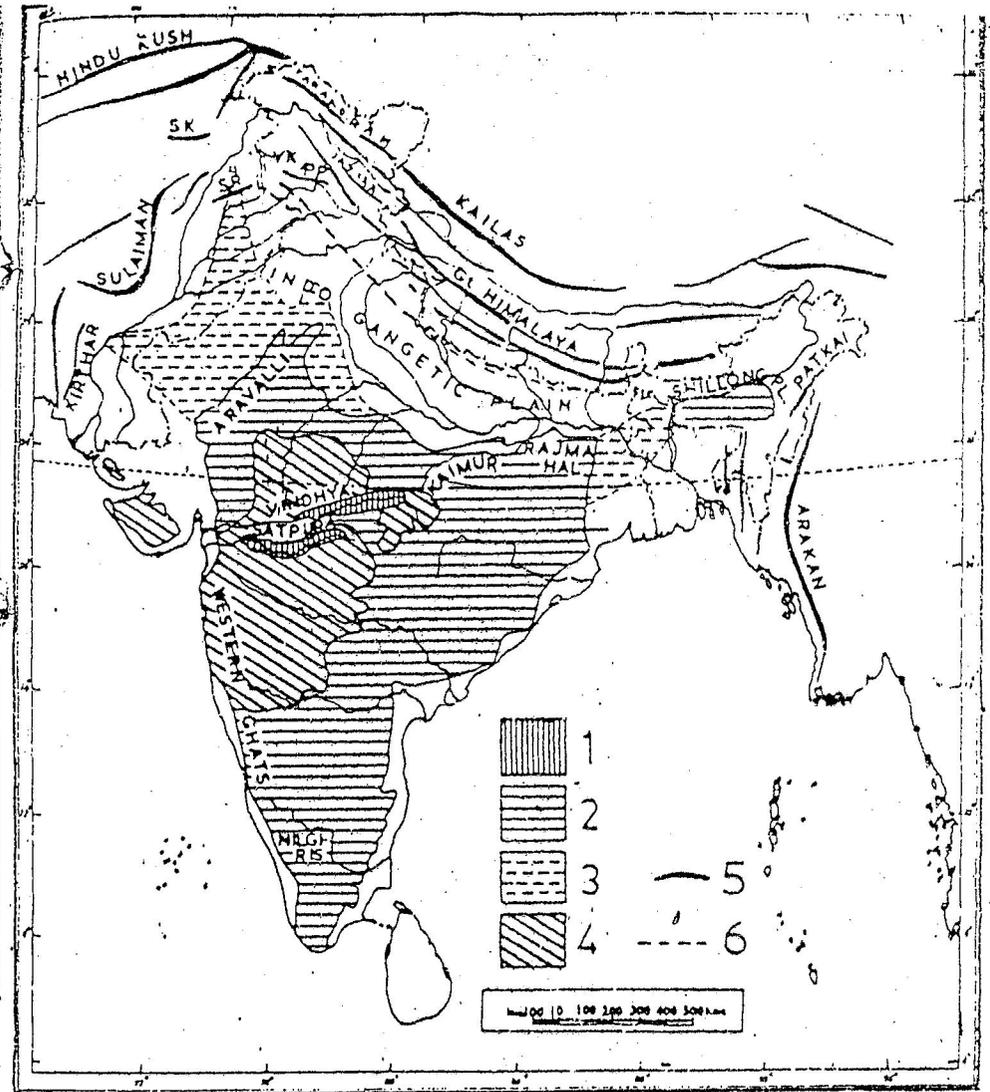


Fig. 3 India: Structural Outlines

1. Narmada and Tapi Trough; 2. Peninsular Blocks; 3. Concealed Extension of 2; 4. Deccan Lava; 5. Trend of Main Tertiary Fold Ranges; 6. Siwalik Hills; S.K. Sefed Koh; S.R.—Salt Range; P.P.—Pir Panjal; V.K.—Vale of Kashmir.

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 The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.

ranges are described as youthful. The southern Plateau, on the other hand, is an old mass of the earth's crust worn down by successive cycles of erosion. As a consequence, the Plateau has acquired the looks of old age. It has a characteristically senile topography, dominated by erosion surfaces, though at several levels rather than a single one, and broken by striking ridges and trough valleys. In between the Himalayan mountain chain and the Peninsular Plateau lies the North Indian Plain. The Plain occupies an initial basin filled by deposits brought down by the rivers through the ages. The filling has been done so uniformly that the Plain gives an impression of a flat surface, which it is not. It has its own physical diversity, mainly contributed by the depositional work of the rivers as seen in the river bluffs and the terraces of *bhangar*, or the older alluvium.

The boundary line between the arc of the Himalayan ranges and the Indian Plain is clearly marked out. This however, is not so in the case of the boundary line between the Plain and the Peninsular Plateau. The northern boundary of the plateau runs parallel to the Ganga and the Yamuna from the Rajmahal Hills in the east to the ridge in Delhi. From Delhi to Kachchh it runs parallel to the western flank of the Aravali Range. However, in many places the alluvial deposits of the Ganga and the Yamuna are found south of this line, overlying the northern flank of the Peninsular Plateau. The present day relief features of the three physiographic divisions of India have evolved in the course of a long and chequered geological history. Let us turn some of the pages of this fascinating history of the past to appreciate the peculiarities of their journey through corridors of time.

Evolution of Relief Features

The Plateau

We are told by the geologists that the Peninsular Plateau lies over one of the several major plates of the Earth's crust. This plate is known as the Indian Plate. The Plateau is a block of old crystal rocks. It was lifted above the level of the sea in which these rocks were deposited in the Pre-Cambrian times and never submerged again. By and large this tabular upland has acted as a rigid and inflexible block all through, and as such has often been compared to a 'horst'. The fact that it has remained above the level of the sea since the Cambrian times is perhaps of the greatest significance in its entire physical evolution. The first major event in the structural history of the Peninsular block was recorded in the Vindhyan (Palaeozoic) times when an upheaval of great vigour tightly folded the strata of the geosyncline of the Aravali region into a great mountain range. The present much worn out Aravali range is a poor match to its Vindhyan counterpart. It is believed that the Nallamalai Range of the South also acquired its present form roughly at the same time as the Aravalis were uplifted. Barring this episode, involving the folding of rock strata, Peninsular block has remained generally immune to the impulses generated by the folding movements in the regions lying to its north. While buckling and warping of the strata have not been prominent, the Peninsular horst has been the scene of far more deep rooted movements. Faulting and fracturing of the crust associated with vertical movements (upward or downward) due to forces generated by an accumulation of tension due to the movement of the plates have been quite common. Every uplift, or

subsidence, has resulted in renewed erosional activity with consequent appearance of youthful features of relief on an otherwise senile topography. Evidence of such geologically recent uplift is seen in the Palni and Nilgiri Hills. The trough-faulting of the valleys of the Godavari, Mahanadi and the Damodar and the faults of the Narmada and the Tapi valleys and of the Malabar and Makran coasts, on the other hand, bear testimony to the subsidence of the crust.

At a time when the Himalayan ranges were being uplifted two events of great significance occurred on the Plateau. The north-western part of the Plateau saw an extensive volcanic eruption leading to the formation of the horizontally arranged beds of the Deccan lavas; the western flank of the Plateau subsided resulting into a landward advance of the Indian Ocean. This subsided portion of the Plateau is occupied by an expanse of the Arabian Sea. The foundering of this flank has given to the Western Ghats a prominence worthy of a mountain range. The other view that the Ghats have been formed as a result of an eastward tilting of the entire Peninsular block is not generally accepted as it is not supported by sufficient evidence. In so far as the age of the Arabian Sea, now occupying the foundered western flank of the Plateau is concerned, the general consensus or opinion is that it might not have originated earlier than Pliocene, perhaps even late Pleistocene. The eastern coast and the adjoining continental shelf, however, furnishes evidence quite contrary to this. The general view is that by and large not much change has occurred in the position of the coastline since the upper Palaeozoic. It has thus been an area of relative quiescence (see Fig. 3).

The Himalaya

As compared to the Peninsular Plateau whose exposure to the forces of erosion for

the greater duration of the earth's geological history has given a characteristic senile look, the Himalaya appear refreshingly young. Unlike the Plateau, the entire Himalayan area as well as the Plain remained under the level of the sea till comparatively recent geological times. The region was occupied by a great geosyncline called the Tethys sea as late as the Mesozoic times. The sediments deposited in the Tethys sea were folded to acquire the present form of the Himalaya, and the associated mountain chains in the very last phase of mountain building in the earth's history. The fact that the sediments deposited in this geosynclinal basin have been subjected to a great deal of structural displacement, bears testimony to its being a weak zone of the earth's crust. This Tertiary mountain building (or orogenic) phase is often referred to as Alpine after the Alps which were also uplifted roughly at the same time.

The Alpine as well as the Himalayan phases of mountain building may be explained in the light of the theory of plate tectonics. It is now generally believed that these mountain building episodes were associated with the movement of the plates. The theory of plate tectonics has replaced the former geosynclinal theory of mountain building. The collision of the plates leads to the building of stresses within the plates and the continental rocks on the top, resulting in folding, faulting and the associated igneous activity.

The Himalayan ranges were formed when the Indian Plate was driven northwards and pushed beneath the Eurasian Plate. With the advance of the Indian Plate towards the north, the Tethys sea started contracting about 65-70 million years ago. About 30-60 million years ago, the two plates came closer and the Tethys sea crust began to fracture into thrust edges. About 20-30 million years ago, the Himalayan ranges started emerging.

Intensive erosion from these mountain ranges resulted in the deposition of molasses in a basin towards the south of the Himalayan range. This initiated the process of infilling of the depression lying to the south.

A close study of the evidence collected during the geological surveys helps in recounting the main stages in this great mountain building episode. It is now more or less established that the events took place in three main phases. The first phase was marked by the uplift of the Central Himalayan axis, largely composed of old crystalline and sedimentary rocks in the Oligocene times. A second uplift took place during the Miocene, involving the warping up of the sediments deposited in a basin which occupied the Potwar region of West Pakistan. The third phase was marked by the folding of the Siwaliks in the post-Pliocene time. The geologists believe that this phase of uplift is still in progress. Even earlier to these three phases was the uplift of the Karakoram and adjacent mountain ranges during the Cretaceous.

From the layout and the strike of the mountain arcs along the Indo-Myanmar border and in north-western India, it may be inferred that the compressional forces acted upon the wedge of the Plateau in these extremities from the east and from the north-west, and that the compressional forces were directed towards the Plateau, over as vast an area as 'three-eighths of the compass affecting the whole northern edge of the sub-continent from the north-west to the east.'

In this process of mountain building the layout and the coast line of the Tethys sea must have played an important role. The geologists and the archaeologists have collected a good deal of evidence which throws light on the very young age of the Himalayan mountains. The occurrence of the tilted beds of the lake deposits of

Kashmir, called the *Karewas*, at high altitudes of 1500-1850 metres on the flanks of the Pir Panjal Range strongly suggests that the Himalaya were in the process of uplift as late as the Pliocene and Pleistocene. The post-Tertiary fossils of some mammals have been found in the sub-Himalayan foothills which point to the possibility of their uplift continuing well into the Pleistocene. The sediments embedded in the Siwaliks certainly belong to the main Himalayan mountain ranges whose worn-down material was deposited in the Siwalik basin. In many of the terraces Himalayan rivers, such as the Sohan (Soan) and in the Siwalik deposits near Chandigarh, archaeologists have found stone tools — typical examples of human artefacts of the Palaeolithic times which indicate that part of the Himalayan uplift in the last phase took place when early man had already appeared on the scene.

Not all the present features of the Himalayan mountains and differences in level which present an example of extremely complex topography were created during the mountain building phase itself. Much of their present relief is due to the work of the agents of erosion, such as the glaciers and running water, which have been eroding the surface ever since the mountains emerged.

The Plain

The great Plain of India occupies the space between the Plateau and the northern mountains. It is believed to have resulted from the gradual infilling of an initial marine depression by detrital material. The alluvial deposits are thus resting on the continental shelf of a sea. The sea has been receding ever since the tertiary times leaving behind layers of sediments consisting of marine, lacustrine and estuarine deposits. They now lie buried

under the thick mantle of alluvium.

It may be noted that there is no comparison between the Himalaya and the Plain in terms of altitude or relative relief. The Plain is not an area of monotonous relief. But, there is a variety of geomorphological features noticed all over the Plain.

The initial depression is believed to be a 'foredeep' formed in the wake of the Himalayan uplift. A part of it was perhaps created as a result of the subsidence of the northern flank of the Plateau in its marginal process of mountain building. The two disconnected outlying segments of the Plateau seen in the Rajmahal and the Garo, Khasi and Jaintia Hills are in fact two ends of a depression created as a result of the downwarping of the Peninsular block due to faulting in an east-west direction. The rift valley of the Damodar river is an extension of the same process of downwarping. The Rajmahal-Garo Hills gap, a downwarp of the Peninsular block has been filled by the alluvium laid down by the Ganga. Thus, the depression is genetically related to the Himalayan mountain building phase. Studies conducted to determine the depth of the alluvium indicate that the present extent of the alluvial deposits does not coincide with the boundaries of the original trough. It suggests that the alluvium spilled over the adjoining parts of the plateau as well.

The evolution of the Plain is thus attributed to a process of gradual infilling of an initial rift valley stretched in front of the northern mountains and formed as a consequence of a fracture in the crust.

Unifying Role of Geological Processes

While the differences in the physical characteristics of the three geomorphological units are fairly sharp, the

similarities are no less striking. In the first place, the respective senile and the youthful features in the Peninsular block and the young folded mountains of the north discussed above are not mutually exclusive. The Plateau has its own youthful features displayed in landforms which have been subjected to uplift in the relatively recent geological past. Nor are the Himalayas completely devoid of features of old age. They have their own worn down surfaces carved out during phases of erosion in the rolling plains and the subdued plateaux interposed between the mountain ranges. Secondly, their physical history reveals that there have been far more intimate and deep-rooted interactions between the two units, i.e. the Himalaya and the Peninsular Plateau than is apparent by their superficial contrasts. Their structural characteristics, as revealed in their rock-formations and their mode of building, as brought out by the tectonic details, furnish ample evidence of their mutual interdependence and borrowings. There is structural evidence to show that the Peninsular block played a crucial role in the great upheavals which led to the emergence of the Himalaya in the Tertiary times. In fact, the edge of the Indian Plate and the relief features, such as those noticed in the Shillong Plateau, the Aravalis and the Kirana Hills near Chenab in the Punjab, seem to have played a very important role in defining the trendlines of the Himalayan ranges, particularly on their north-western and north-eastern extremities. Thirdly, the sediments embedded in the rocks of the Himalayan ranges have similarities to the rocks found on the Peninsular block. On the other hand, the huge accumulations of the sediments forming the surface of the North Indian Plain, lying between the two main physiographic divisions, have been contributed by both of them over millennia

of incessant work of the rivers.

Relief

The main differences in the relief features of the three physiographic divisions of India are largely due to the differences in their geological history and structure. The essential characteristics of the relief features of the Plateau emanate from its being a rigid mass of old rocks which has remained by and large free from horizontal earth movements. The fact that it has remained above the level of the sea since the Cambrian times has contributed in a significant way to many of the peculiarities of its relief features. Its bold features of relief, such as the mountains and the high tors, are generally relict in nature. They have withstood the onslaught of ages of erosion and are standing prominently even today. In many parts of the Plateau there is evidence of the crystal fracturing caused by the epeirogenic movements. The genesis of some of the surface features is also attributed to these episodes of vertical uplift. The antiquity of the erosional processes on the Plateau is also seen in the valleys of the rivers, which are quite shallow and levelled. They seem to have entered the last phase of the cycle of erosion.

In sharp contrast to this is the youthfulness of the features of the Himalayan relief. In fact, a good deal of folding and deformation of the crystal rocks occurred in this area, revealing its initially weak character. Unlike the relict mountains of the Plateau, the Himalayan mountains are tectonic in origin and not just masses of residual rocks. The rivers display in their valleys, and the deep gorges which they have carved out, evidence of their long history of erosion.

The great Plain has its own uniqueness which is best expressed in its level relief. However, the Plain is not an area of

monotonous relief. The diversity of relief features is seen in the levees and bluffs formed by the rivers along their banks. The older alluvial deposits appear like terraces overlooking the flood plains of the rivers. In many areas, in the relatively drier parts of the Plain erosion has led to the formation of the ravines, in the valleys of the Yamuna and the Chambal. These ravines are often referred to as badlands. The Plain has been the scene of aggradational process throughout its history.

The Himalayan Mountain Complex

The Himalayan and the other mountain ranges girdling the sub-continent on the north, northwest and the northeast stretch in a northwest-southeast direction for about 2,400 kilometres between the gorges of the Indus and the Tsangpo-Brahmaputra. The Himalayas are arranged in four main sections separated from one another by the gorges of the different rivers at different points from Arunachal Pradesh to Kashmir. The section between the Indus and the Satluj stretching over a distance of 560 kilometres, is referred to as the Punjab Himalayas; the section between the Satluj and the Kali spanning a distance of 320 kilometres is termed as Kumaon Himalayas. The other two sections between the Kali and the Tista, and between the Tista and the Dihang (Tsangpo-Brahmaputra) are described as the Nepal and the Assam Himalayas, their extent being 800 and 720 kilometres, respectively (see Fig. 4).

This nomenclature is not rigidly followed as there are other regional names also in current usage. The Punjab Himalayas, for instance, have two distinct stretches, often stated as the Kashmir and the Himachal Himalayas. The terms eastern and western Himalayas are also not uncommon.

Likewise, the Himalayan mountain

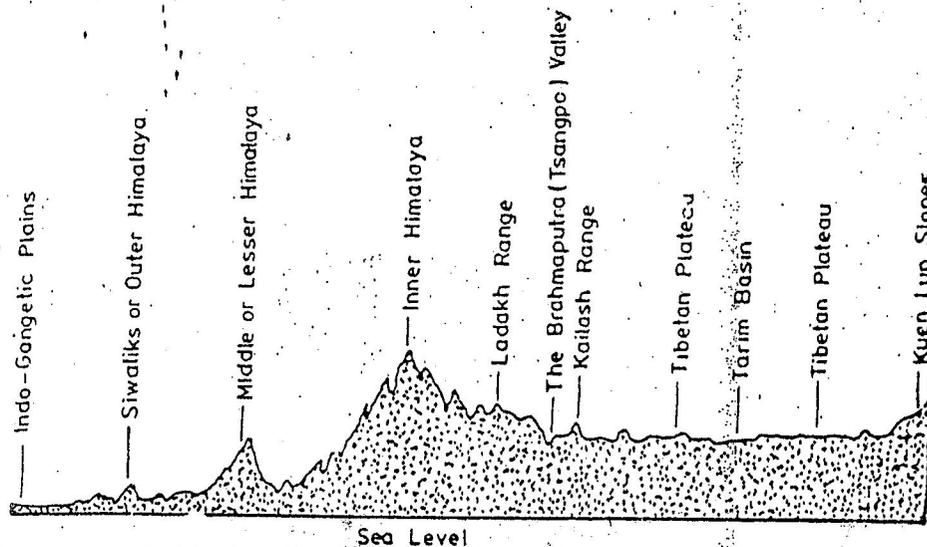


Fig. 4 Himalayan Mountain Complex: A Diagrammatic Representation

chain, all along its longitudinal axis, is arranged into three main series of parallel ranges sometimes referred to as the Great Himalayas, the Lesser Himalayas and the Sub-Himalayas and at others as the inner, the middle and the outer Himalayas. These ranges are separated by intervening spaces occupied by longitudinal valleys of tectonic origin connected with the Himalayan uplift or plateaux marking the erosion surfaces of an earlier age.

The high and the undulating plains of Aksai Chin, Deosai, Depsang and the Lingzi Tang furnish evidence of the existence of the erosion surfaces older than the mountains themselves as they belong to the Upper Cretaceous. On the other hand, the examples of the narrow longitudinal valleys are seen in the numerous 'duns' such as the Dehra Dun, Kothn Dun and Patil Dui. Here, the most

notable example of a tectonic valley is that of the Vale of Kashmir, perhaps one of the most beautiful tracts in the entire Himalayas.

The altitude as well as the physiographic complexity increases from the outer to the inner Himalayan ranges. The inner Himalayas which have an average altitude of 6,000 metres have within them almost all the prominent Himalayan peaks such as Mt. Everest (8,848m), Kanchenjunga (8,598m), Nanga Parbat (8,126m), Nanda Devi (7,817m) and Namcha Barwa (7,756m). The Lesser or the Middle Himalayas extend over a width averaging 80 kilometres with a general altitude of 3,700 to 4,500m. The sub-Himalayan foothills extend over a width of 10-50 kilometres with an altitude ranging between 900 and 1200m. They have no comparison whatsoever with the mighty

Himalayas further north. In the north-west, the Himalayan ranges coalesce with the variedly arranged mountain chains of the Karakoram, Hindu Kush, Kun Lun, Tien Shan, Pamir, Alay and the Trans-Alay Ranges which converge on the central promontory of Pamir.

The general northwest-southeast axis of the Himalayas suddenly undergoes a sharp change on the western as well as the eastern extremities. On these ends lie the Indus and the Dihang gorges. The strike of the mountains first takes a southerly and then a south-westerly bend. The bend is so sharp that it is comparable to a hairpin. It gives the impression as if the rock formations were bent round a pivot. These syntaxian bends of the Himalayas, as they are called, were formed as the rock strata were pressed against the protruding tongues of rocks of the Peninsular block exposed on the two extremities. These bends, however, pose the question of the actual limits of the Himalayas. One view is that the Himalayas terminate with these great bends. Others, however, do not accept this sudden bend as a terminal point at all. They argue that the bends hardly affect the essential physical unity of the mountains which extend further southwards from these points. This group tends to accept that the mountains lying beyond the Indus, such as the Hazara, the Sulaiman, the Bugti, the Kirthar and the Makran Ranges and those lying beyond the Dihang gorge, such as the Indo-Myanmar Hills, the Arakan Yoma and the Tenasserim ranges are projections of the Himalayas themselves. Another view is that the main Himalayan range continues further eastwards even beyond the Dihang gorge. This Indo-Chinese extension is pierced by the gorges of the upper Salween, Mekong and the Chang Jiang.

Many of the Himalayan ranges, both

in the inner and the middle sections, are orthoclinal in their structural plan, which means that they have a steep, scarp-like face on the southern side, overlooking the Plain, while they incline gently towards the Tibetan side. This makes these ranges far more formidable if approached from the south. The orthoclinal plan has also resulted in the uneven distribution of snow on the northern and the southern faces. The northern face has a greater accumulation of glaciers as it is a shady area and receives relatively lesser amount of sunshine.

Another striking feature is the difference in the arrangement of the mountain ranges of different altitudes between the Eastern and the Western Himalayas. The Eastern Himalayas rise rather abruptly from the plains of Bihar and Bengal with the highest peaks of Mt. Everest and Kanchenjunga located quite close together. In contrast, the Western Himalayas attain height through a graded series of low ranges. Here the first stage is set by the sub-Himalayan hills of Jammu and Kashmir, the second by the lesser Himalayan ranges of Pir Panjal and the Dhauladhar, and the third by the Great Himalayan, North Kashmir and the Zaskar Ranges. Further northward they are replaced by the Ladakh, Kailash and the Karakoram ranges.

A little different than the geographical classification of the Himalayas described above is the four-fold geological division of the Himalayas based on the age of rock formations and their type. The geological divisions are given below :

1. The Tibetan zone, composed of fossil-bearing sedimentary rocks ranging from Paleozoic to Eocene of the Pleistocene era, lies to the north of the Great Himalayas.
2. The central or the Himalayan zone of isoclinal folds incorporates parts of the

Lesser as well as the Great Himalayas. This zone is mainly composed of crystalline and metamorphic rocks, such as granites, schists and gneissess, although sedimentary deposits of the *purana* series are also not uncommon. It has a simple structural plan, and the rock strata have not horizontally moved from the basin in which they were originally deposited.

3. This is succeeded by the Himalayan Nappe Zone of overfolds and thrust faults of a more complex type where large bodies of older rocks have been physically displaced and thrust on the newer one along the recumbent folds over large areas. The Nappes are a characteristic feature of the Himalayan architecture, particularly in the Kashmir, Himachal and Garhwal regions.
4. Lastly, the outer or the Sub-Himalayan zone, corresponding to the Siwaliks, is composed of the sedimentary deposits belonging to the upper Tertiary and believed to have been derived from the eroded materials of the main Himalayan ranges themselves.

As noted earlier the original relief of the Himalayas has been extensively modified by the incessant work of the running water and the glaciers. Besides the awe-inspiring gorges of the major rivers, which bear testimony to their erosive power, evidence of the vigorous glacial action is scattered all over the Himalayas. This evidence is found in the features noted below:

- (a) large blocks of rocks transported from the high summits of the Himalayan range over long distances;
- (b) *Karewas* of the Kashmir Valley comprising thick deposits of glacial

clay and other materials embedded with moraines;

- (c) numerous U-shaped and hanging valleys found at elevations much lower than the position of the existing glaciers; and
- (d) extensive moraine deposits along the river valleys which in many areas form well developed terraces, particularly on the flanks of the surrounding mountain ranges in the Kashmir Valley.

A close study of these glacial features has given rise to the view that the Himalayas underwent different phases of glaciation which were cyclic in their sequences and were interspersed with warmer periods characterised by an accelerated activity of running water. The terraces of the Himalayan rivers furnish enough evidence of this phase of increased fluvial activity.

The North Indian Plain

The Great Plain of India, formed by the Indus, the Ganga and the Brahmaputra rivers has been an area of immense significance in Indian history. The alluvial plains all over the world have been the cradles of civilization. The Indus valley civilization is considered as one of the oldest civilizations. The scene of civilization shifted to the Ganga Valley after the decline of the Indus Valley civilization. These civilizations were based on the cultivation of crops. Agriculture was supported by a rich soil cover, favourable climate and adequate water supply.

It has been customary with the writers on Indian geography to dismiss the plains as an area of monotonous relief having little variety in its geomorphological features. That, this is far from truth, will be clear from the following description of its relief features which have evolved as a result of an interplay of the processes of

deposition and erosion. It is true that so far as diversity of the geomorphological features is concerned there is no comparison between the Himalayan Mountains and the Plain, or even between the Plain and the Peninsular Plateau, as there are important differences in scale. But the plain has its own diversities of relief which deserve consideration.

The Plain extends for 3,200 kilometres between the mouths of the Ganga and the Indus, all along the foot of the mountains, with a width varying from 150 to 300 kilometres. The longitudinal extent from the banks of the Ravi and the Satluj to the Ganga delta alone is no less than 2,400 kilometres. The Plain is narrowest in Assam with its width varying between 90 and 100 kilometres. It is 160 kilometres wide near the Rajmahal Hills and 280 kilometres near Allahabad.

The deltaic tracts of Bengal and Sind have interesting differences between themselves; both in their layout and in their depositional features. The Ganga Plain extends for 430 kilometres from the Rajmahal hills in Bihar to the edge of the delta. The Indus plain extends for 960 kilometres from the Chenab hills to the delta. The width of the deltas of the Indus and the Ganga is not identical. The Ganga delta measures 480 kilometres across while the Indus delta measures only 160 kilometres. The differences in depositional features are far more significant. It is a well known fact that the capacity of a river to deposit detrital material in its deltaic region depends on the volume of water flow and the silt content that it carries. The Ganga flows from a relatively drier area to a region of increasing rainfall with the result that most of its tributaries carry a large load of silt to the deltaic region. The Indus, on the other hand, flows from a region of high rainfall to a dry area, with its lower course virtually lying in a desert. The Indus and

its tributaries, therefore, do not gain but lose water as they flow towards the deltaic region. They drop a good deal of their load of sand and silt much above the cone of delta. These differences are evident in the size and grades of the detrital material deposited by the two rivers. The alluvium of the Sind delta is definitely coarser.

As noted earlier, the extensive aggradation surface of the Plain has resulted from an infilling of the initial depression by the incessant work of the Himalayan rivers. The infilling has not been homogenous as there are striking differences in the depth of the alluvium between the Ganga and the Indus basins. Recent studies show that the maximum depth sounded so far is of about 2,000 metres. Obviously, there is no uniformity in the thickness of the alluvium in either the Ganga or the Indus basin. The alluvial deposit is shallow in the Indus basin as compared to the Ganga.

Generally the Plain is recognised as consisting of four divisions each characterised by important differences in surface relief. These divisions are (i) *Bhabar*; (ii) *Tarai*; (iii) *Bhangar*; and (iv) *Khadar*. The *bhabar* lies all along the foot of the Siwaliks with a remarkable continuity from the Indus to the Tista. This zone is studded with pebbles and it consists of porous beds which have been laid down by the numerous streams as they descend down the hills. The porosity is so high that all streams lose themselves in the *bhabar*. The pebble beds are usually parallel to the slope of the river beds. However, exceptions to this rule are also not uncommon. It has been observed that the flat single beds are sometimes tilted against similar beds a little downstream. The *bhabar* is generally a narrow belt, only 8 to 16 kilometres in width.

The *terai* is marked by a re-emergence of the streams on the surface from the

bhabar zone. It is a zone of excessive dampness (wetlands and marshes) with a thick growth of forests and a variety of wild life.

The older alluvium of the Plain is called the *bhangar*. It forms the alluvial terrace above the level of the flood plain. It is often impregnated with calcareous formations known as *kankar*. The younger alluvium of the flood plains of the numerous rivers on the other hand is called as the *khadar*.

There are striking differences in the character of local relief in different parts of the Plain despite the remarkable regularity of the general plan of these four-fold sections. The *bhangar* in the deltaic region of Bengal has been arranged into low uplands with extensive laterite formations such as the Barind. The *bhur* formation in the upper Ganga-Yamuna doab, another example of such differences, will be described in the following paragraphs.

The depositional history of the North Indian Plain shows that the aggradational activity carried out by the numerous rivers since the Pleistocene has resulted in the formation of two main relief features: (1) the alluvial fans or cones, and (2) the intervening slopes which may be termed as intercones. The cones have been formed as the alluvium fans out over a triangular space from a point where the rivers flow down the hills. This pattern of deposition is common in all the Himalayan rivers. Chaghara is, however, an exception. The triangular plan of the cones is such that their base lies towards the edge of the plain and their apex at the points of debouchure from the hills. The cones have a generally convex form. The intercones have a reversed plan as their edges are concave.

With the progress of deposition, the cones and intercones have in some cases merged, to form 'cone-foot plains'. The general gradient in such plains varies from

1:10,000 to 1:12,000.

Simple cones have been formed by most of the Himalayan rivers. Notable exceptions are those of the Beas, the Ravi, the Mahananda and the Tista rivers, which have formed composite cones. The North Bihar Plain offers the best example of such a plan of alluvial cones and intercones. Lying between the Himalayan foothills and the Ganga, the North Bihar Plain is composed of the three cones of the Gandak, the Kosi and the Mahananda-Tista, separated by intercones. These cones have been formed by a large number of tributaries which have a typical radial plan. The size of the cone, however, varies from one river to the other, depending on the volume of water and the load of silt carried by it. It also depends on the past changes in the river courses. The case of the Kosi may be cited here as an illustration. It has been observed that the Kosi raises the level of sand in its flood plain by 30 centimetres in a normal season.

There exist interesting differences in local relief over the entire extent of the North Indian Plain from Sind to Assam. Each of the segments of the Plain has thus acquired a distinctive character of its own and deserves a mention.

Let us begin with the Indus plain. To the west of the Indus, the plain is mainly formed of *bhangar*. While the northern part is a clay *pal* desert, the southern part is generally sandy to loamy and is dotted with tiny lakes. The plain lying to the east of the river is typically deltaic in relief. The surface formed by recent deposition of alluvial sands and clays has remnants of the former river courses in the long, narrow depressions called *dhoro*s. Along some of these dry courses, such as the Eastern Nara, there occur numerous alkaline lakes locally known as *dhands*. Towards the east, the Indus delta gradually loses itself

in the mud and salt wastes of the Rann of Kachchh.

The partition of the country which divided the essential physical unity of the Punjab Plain should not stand in the way of recognising the elements of this unity as revealed in the geomorphological features. The depositional processes operating over time have united the *doabs* of the five rivers (Punjab) into a homogenous geomorphological entity. These *doabs* have maintained their identity ever since the first settlement of the Aryan speaking tribes in what was known as the *Sapta Sindhu*, the land of seven rivers. From east to west these *doabs* are known as:

1. Bist Jalandhar *doab*, lying between the Beas and the Satluj;
2. Bari *doab*, between the Beas and the Ravi;
3. Rechna *doab*, between the Ravi and the Chenab;
4. Chaj *doab* between the Chenab and the Jhelum; and the
5. Sind Sagar *doab*, between the Jhelum-Chenab and the Indus.

The main features of the topography of the Punjab Plain have been derived from a long process of alluvial deposition carried on by its five rivers. The mass of alluvium has been broken by the river courses which have carved for themselves broad flood plains of *khadar* flanked by bluffs, locally known as *dhaya*. These bluffs, as high as 3 metres or more — have been heavily gullied. The *khadar* belt, known as bet lands, though liable to flooding, is valuable for its agricultural potential.

Towards the east, these alluvial features continue in the Indian Punjab with a remarkable regularity. The northern part of the plain adjoining the Siwalik hills, has witnessed intensive erosion at the hands of a network of streams called *chos*. This has resulted in enormous gullying,

The mass of sand deposited by these *chos* is arranged and re-arranged after every flood, and stream banks are so unstable that their beds go on shifting continuously. The erosion by the *chos* is particularly noticed in Hoshiarpur.

The outliers of the Aravali hills, particularly in the south-eastern part of Haryana, introduce features of topographic diversity in the otherwise alluvial plain.

The Ganga Plain in Uttar Pradesh and Bihar consists of a number of historically well-known regions e.g. the Ganga-Yamuna Doab, Awadh and Mitthia Plain. The Plain has been formed by the detrital materials brought down by the Yamuna, Ganga and the Ghagra and their tributaries aligned parallel to them. On the north the Siwaliks skirted by the *tarai* belt form a knife-edged boundary. This, however, is not the case on the south where the boundary line is broken by the interpenetration of the Peninsular rocks. South of the Yamuna, the thin alluvial veneer merges with the spurs of the plateau in the narrow flood plains of its tributaries namely, Chambal, Betwa and Ken. An intricate maze of gullies and ravines in this reach of the Yamuna and in the lower reach of the Chambal merits the use of the term badlands (see Fig. 5).

Both the *hhabar* and the *tarai* belts are well formed in the Uttar Pradesh segment of the plain, although much of the *tarai* forests has now been cleared and replaced by agricultural fields.

The Ganga-Yamuna Doab is a geomorphological entity. The surface alluvium has a thickness of 1,000 to 2,000 metres. The land slopes from north to south, but there are many micro slopes. The old *bhangar* alluvium of the doab has formed flat uplands of the newer alluvium. The intervening slopes, which are often quite pronounced with relative variations of 1.5 to 30 metres in relief are locally

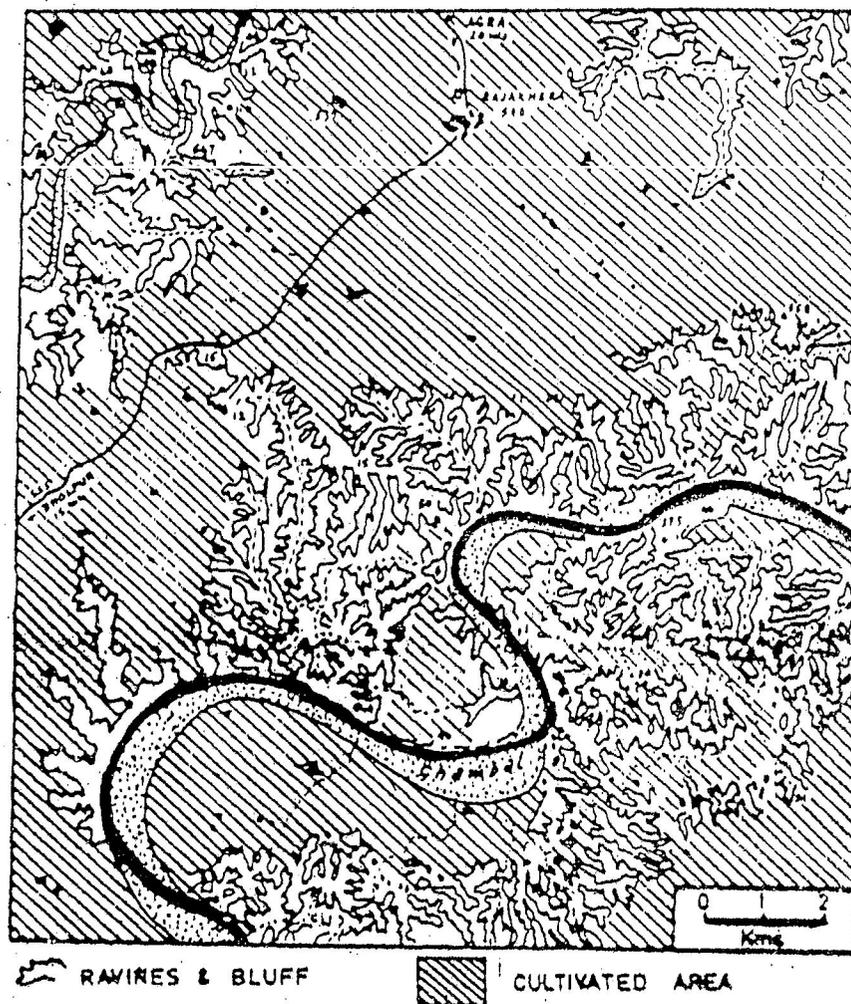


Fig.5 Chambal Badlands

known as *khols*. There are notable differences in the development of the drainage channels as well as the other relief features in the three sections of the alluvial mass. It has been observed that

the *khols* along the Yamuna have a variation of 6 to 15 metres in relative relief. This variation is of the extent of 12 to 20 metres in the case of the Ganga *khols*. The generally flat character of the *khadar* land

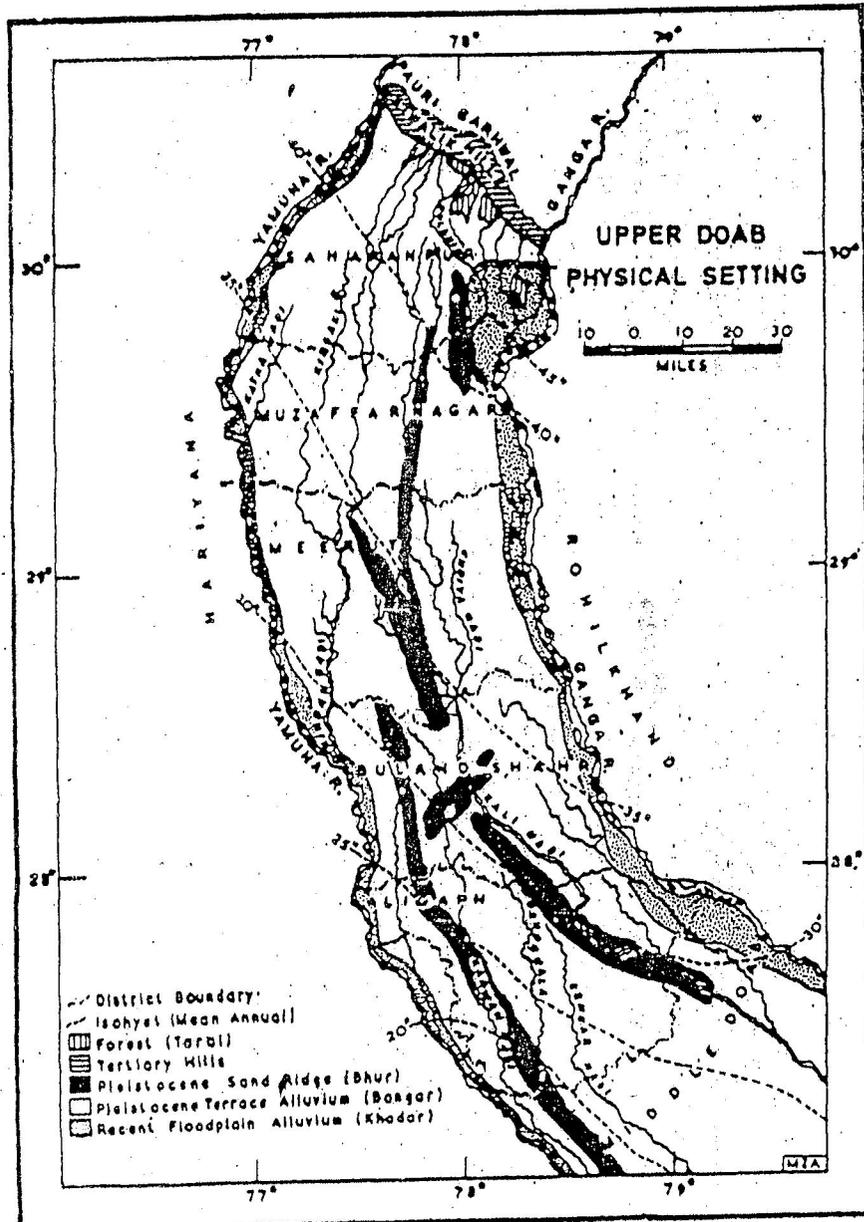


Fig. 6. Upper Ganga-Yamuna Doab—Relief Features

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is evident from the fact that the relative relief varies from 4 to 6 metres only. On the other hand, it varies from 6 to 10 metres on *bhangar* uplands. Two distinct alluvial terraces have been identified — a younger terrace and an older terrace both in the Ganga and the Yamuna *khadar*. They are flanked by two natural levees. The older levee has been more extensively eroded obviously because of its age.

Another unusual relief feature of the upper doab is seen in the aeolian *bhur* deposits. The *bhur* also forms a belt of undulating sandy uplands on the eastern bank of the Ganga in Moradabad and Bijnor districts. The origin of the *bhur* is attributed to the Pleistocene period and the present layout, in the form of continuous ridges on the *bhangar* upland, seems to be the outcome of the coalescence of the two heads and channel bars in a braided stream. The *bhur* ridges have given rise to the typical *bhur* soils in the middle doab (see Fig. 6).

The Ganga Plain in Uttar Pradesh merges with the deltaic plain in Bengal through a transitional zone lying in Bihar and characterised by the fan-like cones of the numerous rivers both north and south of the Ganga.

The deltaic plain in West Bengal, as in adjoining Bangladesh, is all 'new mud, old mud and marsh'. The detrital plain is characterised by areas of deposition — the delta, and areas of corrosion — the para-delta. The distinction is technical and based on the geomorphological processes, specific to each. Broadly speaking the delta of the Ganga lying between the Hugli Bhagirathi, Padma-Meghna and the sea is replaced on the west by a piedmont plain between the Hugli and the Peninsular Plateau. On the north lies the para-delta of the Ganga-Brahmaputra doab. The *terai* belt of the Duars lies further north. To the east, the delta merges into the plains of

the Surma Valley and the Meghna.

The Brahmaputra Plain extends in Assam for about 640 kilometres from Dhubri to Sadiya, with a general width of 90 to 100 kilometres. All of it is formed of the alluvial terraces of the Brahmaputra and its tributaries.

The Peninsular Plateau

Rising from the alluvial plain in Uttar Pradesh and Bihar, south of the Yamuna and the Ganga, the Great Indian Plateau extends towards the south. It thus encompasses the whole of the peninsular region. With a general elevation of 600-900 metres, the Plateau forms a triangle with its concave base lying between the Ridge at Delhi and the Rajmahal Hills and the apex formed by Kanyakumari. The outlying projections of the peninsular plateau are seen in the Aravalis, Rajmahal Hills and the Shillong plateau. These hills convey some idea of its original northerly limits. A part of the northern flank lies buried under the alluvial deposits of varying thickness. As suggested by the Chambal, the Son and the Damodar, the Plateau first slopes to the north and the east, and thence, after the Vindhyan-Kaimur Range to the west. South of the Satpura-Maikala ranges the general slope of the land is to the east and the south-east. On its extreme western edge the Plateau, however, slopes with a steep gradient leaving only a narrow coastal plain facing the Arabian Sea. It has been noted that the present relief features of the Plateau have evolved in the course of a long and eventful geological history. The Plateau has remained above the level of the sea for most of its history with the result that the forces of erosion have acted upon it for hundreds of millions of years. This history was characterised by recurrent phases of uplift or submergence, accompanied by crystal faulting and fracturing. These events have introduced

important elements of diversity in the relief of the peninsular upland.

The northern flank of the Plateau from the Thar Desert to the Rajmahal Hills is characterised by features which can be described as the remnants of the old mountain ranges, scarped plateaus and faulted troughs. The erosion surfaces of Chhotanagpur, the dissected gneissic country of Bundelkhand, the trough-valleys of the Damodar, the Narmada and the Tapi, the boldly rising hill-ranges of the Nilgiri and the Annamalai-Palani-Cardamom group and the broad, shallow valleys of the Godavari and the Kaveri all represent distinct stages in the physical evolution of the peninsular block.

The Indian Plateau is a region of great geomorphological complexity. As observed by a writer, 'the plateau merges with plateau, river-basin with river-basin'. However, one can develop a clear understanding of the physical landscape by recognising the following more or less distinct physical entities :

- (a) The southern plateau block is formed mainly of granites and gneisses with bordering hilly prominence such as the Nilgiris and the Annamalai-Palani-Cardamom group of hills. It occupies the whole of the southern and the eastern part of the peninsula.
- (b) The Deccan lava plateau, an elevated table land consisting of horizontally arranged lava-sheets deposited during the last phase of the volcanic eruption.
- (c) The Malwa plateau dominated by the Vindhya scarps (escarpments) forming the northern flank of the plateau.
- (d) The deeply worn-down and eroded Aravali range forming a complex of hill ranges on the north-western flank of the Plateau.

- (e) The troughs of the Narmada and the Tapi rivers interposed between the Vindhyan and the Satpura ranges.
- (f) The river-basins of the Mahanadi, the Godavari, the Krishna and the Kaveri with subdued features of river work and alluvial deltaic plains.
- (g) The narrow coastal plains on the periphery of the plateau bordering the Bay of Bengal and the Arabian Sea. The Chhotanagpur plateau rises to culminate in the Hazaribagh Range, a little above 1,070 metres in height. The plateau consists of a series of erosion surfaces. They are generally below 600 metres in altitude.

The western and north western flank of the plateau is occupied by the Aravalls, a relict mountain range much denuded and forming discontinuous ridges. Aligned in a northeast-southwest direction the Aravalls form discontinuous ridges which extend from Gujarat to Delhi. The hills mainly lie in Rajasthan having an imposing relief south-west of Ajmer. However, they fan out in parallel series of low ridges, north-west of Jaipur towards Haryana and Delhi. On the periphery of the Vindhyan upland to the west of the Aravali Range lies the Thar Desert. This is a sandy waste, an area of arid topography. The surface features consist of crescent-shaped sand dunes called *barkhans*. The sand is arranged in the form of longitudinal ridges in Jaisalmer and beyond the Indo-Pakistan border in the province of Sind.

To the east of the Aravalls and the Vindhyan plateau of east Rajasthan lies the dissected upland of Bundelkhand. Its topography is an outcome of the intensive erosion of the gneisses and the quartzites. Its rugged character is illustrated in the series of hummocky hills and the wall-like

quartzite dykes offering natural sites for storage of water.

The upper reaches of Chambal and the Betwa together drain the relatively open Malwa plateau. This has been an important centre of human agglomeration as it is interposed between the generally inhospitable Aravallis and the Bundelkhand gneissic country.

The relief of the Plateau in this middle sector is dominated by the great escarpment formed by the Vindhyan-Kaimur Range between the valleys of the Narmada and the Son. East of the Son, the Chhotanagpur consists of horizontally arranged lava-sheets.

The Peninsular Plateau does not terminate here. In fact, it continues beyond its outliers, represented by the Rajmahal Hills, even though the great bend of the Ganga appears to be the terminal point. However, another fragment of the peninsular block is found in the Shillong Plateau which gives the indication of a possible connection. The connecting rock formations are now lying buried under the Ganga alluvium.

The Shillong Plateau is a highly dissected and forested tract. It extends over an area of about 240 by 96 kilometres with summit levels reaching an elevation of 1300-1800 metres. The plateau descends in a steep slope towards the Surma Valley. The northern outliers are represented by the Mikir and the Rengma hills.

The Deccan lava plateau has a generally homogenous relief. The plateau surface, made up of flat lava floors, generally slopes to the east and the south-east. The plateau is, however, divided into a number of well-defined physical units, such as the Vidarbha plain, upper Godavari basin and the Bhima basin, separated by lines of low hill ranges and tabular uplands. The Ajanta and the Balaghat ranges are more like tabular

uplands than hills. The Deccan lava plateau has its western outlier in the Kathiawar peninsula.

To the south, the Deccan lava formations give way to the gneisses and the granites of which the Karnataka plateau is made up. It has a general elevation of 450-800 metres in the north but rises up to 900-1100 metres. The Karnataka Plateau has its two main subdivisions in the Malnad and the Maidan, having its own distinctive features of relief. The Malnad is a thickly forested highland. It has a series of hills and ranges, the highest of them being the Baba Budan group. The Maidan, as the name suggests, is a rolling plateau surface of generally low relief. These differences are expressed more significantly in the human geography of the two regions.

The topography of the Deccan and the Karnataka Plateaus is dominated by the Western Ghats, which stretch uninterruptedly to the southern tip of the peninsula. They have a general altitude of 900-1100 metres but occasionally rise up to 1600 metres or even more. A sudden change in their physical appearance and structure is seen near Goa, where the highly dissected relief of the lava rocks is replaced by the smoothly rounded hills of granites and gneisses. In this stretch, the Ghats dip to 900 metres but rise once again in the Nilgiri Hills. Further south, the remarkable continuity of the Ghats is disturbed by the Palghat Gap, which is believed to be an abandoned valley of an old river. Similarly, the Shencottah Gap, disturbs the continuity of the Ghats.

East of Nagpur, the Deccan lava region is flanked by the rolling plateau surfaces containing the Wainganga Valley and the upper Mahanadi basin in Chhatisgarh. Chhatisgarh is a region of remarkable uniformity in relief interposed between the Mikir and the Orissa Hills. Mainly drained

by the Seonath, a tributary of the Mahanadi, the terrain rises gradually southwards into the Bastar plateau. Further south the main relief features in Telangana, are made up of gneissic formations; The other series of hills are known as the Eastern Ghats. The Eastern Ghats are generally less impressive and form a discontinuous crest on the eastern periphery of the plateau. They do not have any structural unity or a well defined layout. They are represented by an irregular line of hills, such as the Nallamalais, Vellikondas, Palkondas and the Pachmalais. These hills are often referred to as the Northern hills in the northern sector, Cuddapah Ranges in the middle and the Tamil Nadu hills in the south. In terms of altitude they rarely exceed 900 metres but their highly dissected character poses difficulties in communication.

The general aspect of the eastern and the southern expanse of the plateau is monotonous as it has very little geomorphological variety. Very often the old tors rise above the otherwise dreary plain dotted with lowly hills.

The Coastal Plains

The plateau is flanked by a coastal plain of varied width extending from Kachchh to Orissa. There are, however, striking differences between the eastern and the western coastal plains. With the notable exception of Gujarat, the west coast has a narrow alluvial margin interspersed by hilly terrain. The plain widens out south of Karwar. It has little indentations except in the south (in Kerala) where the beautiful lagoons introduce an element of diversity. In the north, the Konkan coast is 50-80 kilometres wide and is generally flat. It is separated from the coastal plain in Kerala by the coastal plain of Goa having significant estuarine formations near Goa

between capes of Aguda and Marmagaon.

The eastern coast, on the other hand, is a wide plain with well developed deltas of the major rivers, such as the Godavari, Krishna and Kaveri. The climatic transition between the south-west monsoon regime of the north and the north-east monsoon regime of the south has given rise to interesting differences in the alluvial features in different stretches of the east coastal plain. The Coromandel coast (Andhra Pradesh, Tamil Nadu) is overlooked by a discontinuous line of abruptly rising hills and scarps (the Eastern Ghats). In this stretch, the coastal plain is 80-100 kilometres wide and has a thick layer of alluvium, which is particularly so in the deltaic regions of the Mahanadi, Godavari, Krishna and the Kaveri.

The Islands

The Indian islands in the Bay of Bengal consist of the Andaman and the Nicobar groups. Some of these islands are of volcanic origin. There are as many as 200 islands in the Andaman group alone, extending for 350 kilometres. There are 19 islands in the Nicobar group. Some of the islands have a length of 60 to 100 km, forming a cluster south of the Andaman group.

The Arabian Sea Islands consist of the Lakshadweep group. They are formed on a coral deposit off the Kerala coast. The southernmost of these islands lies just to the north of the Maldives.

Drainage

The drainage of the Indian sub-continent has been an outcome of the evolutionary history of the three-fold physiographic divisions as described above. Broadly speaking, the river systems of India can be classified into two categories on the basis of their origin:

- (i) Himalayan rivers, and

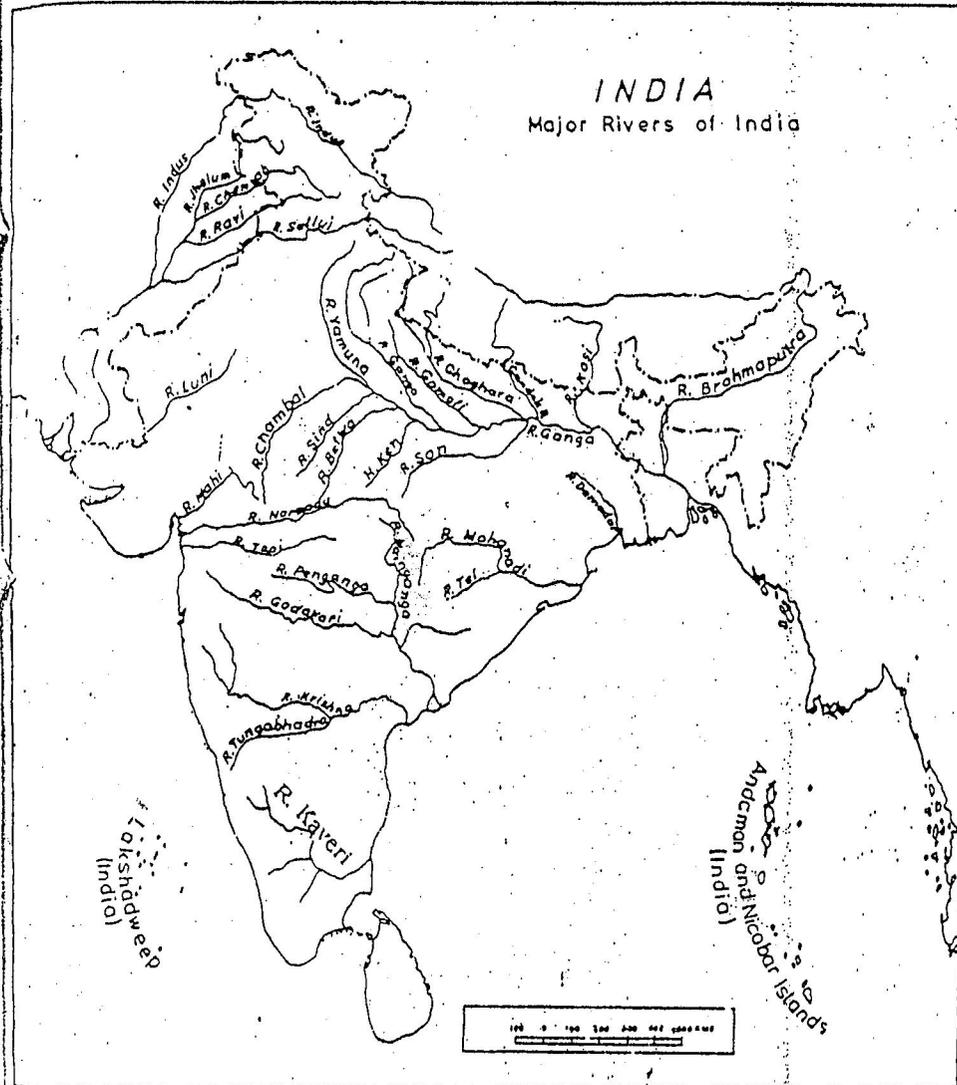


Fig. 7 Major Rivers of India

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The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.

(ii) The Peninsular rivers.

There are significant differences in the drainage features and hydrological characteristics between the two river systems. The rivers of the North Indian Plain, however, have developed their own peculiar features based on the alluvial character of the terrain through which they flow. These rivers have many differences between themselves (see Fig. 7).

The Himalayan rivers have large basins, their catchment areas extending over hundreds of thousands of square kilometres. The Indus drains over an area of approximately 250,000 sq km within the Himalayan region alone. Many of the Himalayan rivers pass through gorges which have been carved out during millennia of erosional activity carried on simultaneously with the uplift of the Himalayas. These rivers aided by the bold features of Himalayan relief, continue to perform intensive erosional activity as is evident from the huge loads of sand and silt transported by them annually. Another striking feature of the Himalayan rivers is seen in their flow pattern which is perennial which means that rivers are dependent on rainfall as well as the snow-melt. The river regimes, although perennial are not free from seasonal variations. The Himalayan reaches of these rivers are highly tortuous. Further south, over the plain they have large meanders and often shift their beds leaving behind residual features, such as ox-bow lakes.

The Peninsular rivers, on the other hand, flow through shallow valleys which are more or less completely graded in most cases. The smooth longitudinal profiles of these rivers indicate that they have very little erosional activity to perform. A large number of them are seasonal as their flow is mainly dependent on rainfall. Even the larger perennial rivers which overflow their banks after the monsoon downpour are more or less dried up during the long dry

season. This immensely reduces their value as a source for irrigation. The hard rock-bed accompanied with the general lack of alluvial deposits on the Plateau surface hardly allow any significant meandering. Many of the Peninsular rivers have, therefore, straight and generally linear courses.

Evolution of River Systems

The rivers of India have acquired their peculiar features in the course of a long process of evolution. In fact, the differences in the character of the Peninsular and the Himalayan rivers, referred to above, are mainly based on the differences in topography and the geological history as a result of which the present geomorphological features have acquired their present form.

The Himalayan Rivers

The Himalayan rivers which consist of the three principal systems — Indus, Ganga and the Brahmaputra — have evolved through a long and chequered history. They originate on the southern slopes of the Tibetan Highlands and first flow parallel to the main axis of the mountains in longitudinal troughs. This is true in the case of Indus and the Tsangpo (Brahmaputra). They take a sudden bend towards the south piercing the towering mountains to reach the North Indian Plain. The evidence furnished by the deep gorges of these rivers, particularly those of the Indus, Satluj, Alaknanda, Gandak, Brahmaputra and Kosi, leaves little doubt that they are older than the mountains themselves. It is believed that they continued to flow all through the building phase of the Himalayas, their banks rising steeply while the beds went lower and lower. This is how the deep gorges must have been formed. Thus, the Himalayan rivers are typical examples of what is called *antecedent drainage*. This also means that

they are not *consequent* to the Himalayan relief.

The geologists believe that the main stages in the evolution of these rivers can be deciphered in the strata of the Siwalik Hills which border the Himalayas in the south almost from end to end. The Siwalik Hills are formed of alluvial deposits consisting of sands, clays and boulder conglomerates. These beds have given rise to the view that they were laid down by a mighty stream. This postulated (imaginary) stream traversed the entire longitudinal extent of the Himalayas from Assam to the Punjab and onwards to Sind all along the foot of the mountains. The remarkable continuity of the Siwalik outcrops all along this axis lends support to this view. The stream is referred by scholars as the 'Siwalik' or the 'Indobrahm' river. The evidence of the young age and the detrital character of the deposits suggests that the postulated stream brought down huge debris from the main Himalayan range in the geologically recent times, ranging from middle Miocene to Pleistocene, and deposited it consistently all along the base of the mountains.

The river, as this evidence tends to suggest, flowed from east to the north-west — from Assam to the Punjab. From there it took southerly course to finally empty itself into a gulf which occupied parts of the Sind and the lower Punjab during the Miocene period. It is believed to have carried the combined flow of the main streams which later came to be known as Brahmaputra, Ganga and the Indus. The thickness and the extent of the Siwalik deposits may be seen as a monument to the stupendous task performed by the Indobrahm. It is this mighty stream that dismembered into the following river systems and the sub-systems:

(a) the Indus,

- (b) the five tributaries of the Indus in Punjab (both India and Pakistan),
- (c) the Ganga and its Himalayan tributaries, and
- (d) the stretch of the Brahmaputra in Assam and its Himalayan tributaries.

The dismemberment is attributed partly to the upheavals which took place during the Pleistocene, in the western Himalayas. The uplift of the Potwar Plateau is also related to these movements. Partly it was due to the headward erosion carried out by its tributaries in the lower course of the stream. These developments brought about a reversal in the direction of flow, with the middle section of the severed stream, i.e. the Ganga of today, taking a southerly course and eventually annexing the Yamuna as its tributary. Till this event took place, the Yamuna had a south-westerly course, and was in all probability a tributary of the Indus. This interchange of tributaries between the Indus and the Ganga system in the region lying between them has been a common phenomenon in the geologically sub-recent times. The postulated Indobrahm was presumably the parent stream from which the present river systems of northern India have evolved.

It may, however, be noted that this theory is not universally accepted. The main premises of the concept of Indobrahm have been challenged on many grounds. First, it is argued that it is not necessary to visualise a stream of the size of Indobrahm flowing all along the longitudinal extent of the Himalayas to explain the occurrence of the Siwalik boulder beds. They might represent a succession of alluvial fans deposited by rivers flowing down the Himalayan slopes which have coalesced over time. Secondly, the evidence furnished by the depositional history in the Ganga delta and in Assam does not fit well with the Indobrahm idea.

Table 2.1
Basin Area of Major Rivers of India

Rivers	Total Basin Area (Km ²)	Basin Area Within India (Km ²)
Indus	1,165,000	321,290
Ganga	1,060,000	861,404
Brahmaputra	580,000	187,110

Table 2.2
Basin Area of the Major Rivers

	(in Km ²)
Indus System	
Jhelum	34,775
Beas	20,303
Ganga System	
Yamuna	366,223
Ghaghara	127,950
Peninsular rivers	
Narmada	98,796
Tapi	65,145
Mahanadi	141,600
Subarnarekha	19,300
Sabarmati	21,674
Mahli	34,842
Godavari	312,812
Krishna	258,948
Kaveri	87,900

The gap between the two northern projections of the peninsular block, i.e. the Rajmahal Hills and the Shillong Plateau has been filled by a thick mantle of alluvium. The alluvium should have been laid down over a much longer period of time than suggested by the authors of the Indobrahm theory. Thirdly, the evidence of the Tipam sand stones of Assam, which were deposited in an estuary situated close to the source of the Indobrahm also poses a serious difficulty in its acceptance. However, the views expressed for and against the postulated Indobrahm have their own strong points and none of them can be easily discarded.

Peninsular Rivers

The broad, largely graded and shallow valleys of the peninsular rivers indicate that they have existed for a much longer period of time than the Himalayan rivers. They have acquired maturity. With the exception of the limited reaches of some of the rivers where recent faulting has occurred, the beds have subdued gradient. The erosional forces are now acting by and large laterally.

Most of the peninsular rivers flow towards the east, while the main watershed lies in the Western Ghats in close proximity to the west coast. Notable exceptions are, however, seen in the Narmada and the Tapi, which flow in a direction opposed to this general trend in troughs not of their own making. These facts can be explained by supposing that the Western Ghats represent an original watershed. However, the subsidence of the western flank of the peninsular block has led to its submergence below the sea and has disturbed the generally symmetrical plan of the rivers on either side of the original watershed. A second major distortion was introduced at the time of the upheaval of the Himalayas when the northern flank of the peninsular block was subjected to subsidence and the consequent trough-faulting. The Narmada and the Tapi flow in such trough-faults and have courses consequent to their general trend. In the process of alluvial activity they seem to have filled the original cracks with their detritus. This largely explains the lack of alluvial and deltaic deposits in their valleys.

Drainage Systems

Himalayan Rivers

As pointed out earlier, the rivers originating in the Himalayan mountains consists of the following three systems.

RELIEF AND DRAINAGE

1. Indus System
2. Ganga System
3. Brahmaputra System

The Indus rises in Tibet (China) at an altitude of 5,180 metres near the Mansarovar lake. It flows west and north-westwards and enters Indian territory in Jammu and Kashmir. The river forming a spectacular gorge in this reach pierces the Kailash range several times. It flows through Ladakh, Baltistan, and Gilgit to finally emerge out of the hills at Attock. The Indus receives its Himalayan tributaries such as the Gartang, Zaskar, Shyok, Shigar, Nubra, Gilgit and Hunza in Jammu and Kashmir. Near Attock it receives the Kabul river. Some of the important tributaries which join the Indus below Attock are the Kurrum, Tochi and the Zohb-Gomal. The collective waters of the well known Punjab rivers — Satluj, Beas, Ravi, Chenab and Jhelum — go to make the Panjanad which falls into the mainstream a little above Mithankot. The Indus flows southwestwards across Pakistan to reach the Arabian Sea east of Karachi. With a total length of 2,880 kilometres the Indus is considered as one of the largest rivers of the world. It has a catchment area of 1,165,000 sq km, of which as much as 321,290 sq km, lies within India. India can, however, utilise only a total amount of 4,195 million cubic metres of water (only 20 per cent) out of its total discharge as per the regulations of the Indus Waters Treaty between India and Pakistan.

Among the Punjab tributaries of the Indus, the Jhelum rises in Verinag at the foot of the Pir Panjal range; while the Chenab, Ravi and Beas have their main headstreams in the Himachal Himalayas. The Satluj rises in Tibet (China) beyond the Himalayan range.

The Ganga river acquires its name after its headstreams — Alaknanda and

Bhagirathi — unite at Devaprayag. Flowing west south-westwards the Ganga debouches from the hills near Haridwar. The main right-bank tributaries of the Ganga in the region of the plain include the Yamuna and the Son, besides the minor streams of the Tons and the Punpun. On its left bank the Ganga, however, receives a large number of tributaries including the Ramganga, Gomati, Ghaghara, Gandak, Kosi and the Mahananda. The total length of the Ganga is 2525 kilometres. It is shared by Uttar Pradesh (1450 km), Bihar (445 km) and West Bengal (520 km). The basin of the Ganga river encompasses an area of 861,404 sq km in India alone.

Beyond Farakka, the mainstream of the Ganga which flows east-southeastwards into Bangladesh is known as Padma. A bifurcation channel runs southwards through the deltaic plain on to the sea. In this reach the river is known as the Bhagirathi-Hugli. It receives the minor streams, such as the Dwaraka, the Ajay, the Rupnarayan and the Haldi all rising in the Plateau area.

To the east of Pabna, near Goalundo, the Padma receives the Brahmaputra, known as Jamuna here. The combined stream continues to flow as Padma, till it receives Meghna to the north of Chandpur. The Meghna flows into the sea dividing itself into numerous distributaries.

The Brahmaputra is one of the largest rivers of the world. It has a length of about 2900 km flowing through Tibet (China), India and Bangladesh. In Assam alone it has a length of 720 km. The Brahmaputra drains an area of nearly 5,80,000 sq km. Of this total, Assam alone occupies 70,000 sq km. It is known as Tsangpo in Tibet (China) which means the 'the purifier'. It rises in the Great glacier in the Kailash range, which lies to the east of the water divide. Its basin is separated from the

Mansarovar lake by the Mariam La pass. Flowing through Tibet, it receives a number of tributaries.

It is one of the most remarkable navigable waterways of the world with boats sailing at an altitude of about 4000 metre above sea level. Beyond Pe, the river suddenly turns to the north-east and north. Traversing in a succession of rapids between high mountains of Gyala Peri and Namcha Barwa, it takes a turn to the south and south-west. It emerges from the foot hills under the name of Siang and then the Dihang. It enters India west of Sadiya town. At this point it receives the Dibang and the Lohit. From here the river is known as the Brahmaputra. Several tributaries join the Brahmaputra in the valley of Assam. Flowing round the spurs of the Garo Hills, near Goalpara, the river enters Bangladesh and meets Padma at Goalundo.

The Tibetan part of the river receives less volume of water and has less silt. In India, on the other hand, it flows through a region which gets heavy rainfall. Besides, some of its tributaries originate in the trans-Himalayan region with considerable discharges. As a result, the discharge of silt is also quite heavy. The Brahmaputra has a braided channel in most of its length in Assam, with a few very large islands within the channel. The shifting of channels is also very common. The Brahmaputra is a turbulent river and is known for frequently creating the havoc of floods in Assam and the adjoining Bangladesh.

The Brahmaputra is among the four largest rivers of the world in terms of volume of discharge at the mouth. This volume is estimated at 19,830 cubic metres per second.

The Peninsular Rivers

The main watershed in the Peninsular

region is formed by the Western Ghats. Major rivers of the Peninsula such as the Mahanadi, the Godavari, the Krishna and the Kaveri flow eastwards on the Plateau and drain into the Bay of Bengal. These rivers have huge deltas near their mouths. Rivers which flow westwards from the Western Ghats are generally small. The Narmada and the Tapi are important exceptions to statement. These rivers flow through troughs which have been formed due to faulting.

Rising in the Brahmagiri range of the Western Ghats, the Kaveri flows for 800 kilometres to join the Bay of Bengal near Kaveripatnam. Its basin area of 87,900 sq km is shared by Kerala, Karnataka and Tamil Nadu. The Kaveri is joined by the rivers Lakshmanatritha, Kōbini, Suvarnavati, Bhawani and the Amravati on the right bank, and Herangi, Hemavati, Shimsha and Arkavati on the left bank.

The Pennar basin interposed between the Krishna and the Kaveri extends over an area of 55,213 sq km. Most of it lies in Karnataka. The Jayamangali Kunderu, Sagileru, Chitravati, Papagin and the Cheyyeru are its principal tributaries.

The Krishna rises from a spring near Mahabaleshwar. Its total length of 1400 kilometres is shared by Maharashtra, Karnataka and Andhra Pradesh. Along with its main tributaries, such as the Koyana, Ghatparbha, Malprabha, Bhima, Tungabhadra, Musi and the Muneru, the Krishna drains an area of 258,948 sq km.

The Godavari, the largest of the peninsular rivers, rises in the Nasik district of Maharashtra and joins the Bay of Bengal in Andhra Pradesh after flowing for 1,465 kilometres. The drainage basin, about 50 per cent of which lies in Maharashtra, extends over 312,812 sq km. Besides Maharashtra, it is shared by Madhya Pradesh, Karnataka, Orissa and Andhra Pradesh. The Godavari is often referred to

as Vridha Ganga or Dakshin Ganga because of its large size and extent. Its principal tributaries include the Pravara, the Purna, the Manjra, the Penganga, the Wainganga, the Wardha, the Pranhita, the Indravati, the Maner and the Sabari. Among them, the Manjra, the Penganga and the Wainganga are the largest and together account for 115,832 sq km of the drainage basin.

The Mahanadi rises in Madhya Pradesh and flows through Orissa to reach the Bay of Bengal. The drainage basin, extending over 141,600 sq km is shared by Madhya Pradesh, Orissa, Bihar and Maharashtra. The total length of the river is 857 km. The Seonath, Hasdo, Mand and the Ib join the Mahanadi on the left bank while the Jonk Ung and Tel join it on the right bank.

The smaller basins of the Subarnarekha and the Brahmani, interposed between the Ganga and the Mahanadi deltas, drain an area of 19,300 sq km, and 39,033 sq km, respectively. The drainage basins of these rivers lie in Bihar, Orissa, West Bengal and Madhya Pradesh. The Brahmani is known as South Koel in its upper reach in Bihar.

Among the west-flowing peninsular rivers, the Narmada and the Tapi are by far the most important. The Narmada, which rises near Amarkantak in Madhya Pradesh, flows west-southwards for a distance of 1,300 kilometres to finally empty itself in the Arabian Sea below Bharuch. The Narmada basin extends over 98,796 sq km and is confined mostly to Madhya Pradesh. Only one-tenth of the area of the basin lies in Gujarat. The picturesque gorge of the Narmada in the marble rocks of Madhya Pradesh is quite well known. Another feature of the Narmada basin is that there are hardly any developed tributary systems; none of the tributaries flows for more than 200

kilometres — the Orisan, with a total length of 300 kilometres, being the only exception.

The Tapi, rising in the Betul district of Madhya Pradesh, flows westwards for 724 kilometres in a trough basin more or less parallel to the Narmada. It is, however, much smaller both in terms of channel length and the catchment area. The basin area of the Tapi extends over 65,145 sq km in Madhya Pradesh, Maharashtra and Gujarat. The Tapi is joined by the Purna, Veghar, Girna, Bori and the Panjhra rivers on the left bank and by the Aner river on the right bank.

The north-western flank of the plateau is drained by the Sabarmati and the Mahi. The Sabarmati rises in the Aravali hills and flows south-southwestwards for a distance of 300 kilometres to the Arabian Sea. The Sabarmati basin extends over an area of 21,674 sq km in Rajasthan and Gujarat. The Mahi rises in the east of Udaipur and drains an area of 34,842 sq km lying in Madhya Pradesh, Rajasthan and Gujarat. It flows south-westwards for a distance of 533 km before it falls into the Gulf of Cambay.

Besides the above-mentioned rivers, the peninsular plateau has a large number of coastal streams draining the narrow coastal plains. There are as many as 600 tiny streams which drain the western face of the Western Ghats alone. Their plains are narrow and their beds have a generally steep gradient.

River Regimes

The pattern of the seasonal flow of water in any river is called its *regime*. The main differences in the flow patterns of the Himalayan and the Peninsular rivers are in fact caused by the differences in climate. As noted earlier, the Himalayan rivers are perennial and their regimes are dependent on the pattern of water supply both from snow-melt and rainfall. One can say that

their regimes are monsoonal as well as glacial. The regimes of the Peninsular rivers, on the other hand, are only monsoonal as they are controlled by rainfall alone. Between themselves the regimes of the Peninsular rivers differ because of the differences in the seasonal

distribution of rainfall in various parts of the plateau.

Figure 8 shows the regimes of the two Himalayan and the two Peninsular rivers, just as illustrations. These graphs known as hydrographs, depict the seasonal pattern of river discharge. The discharge

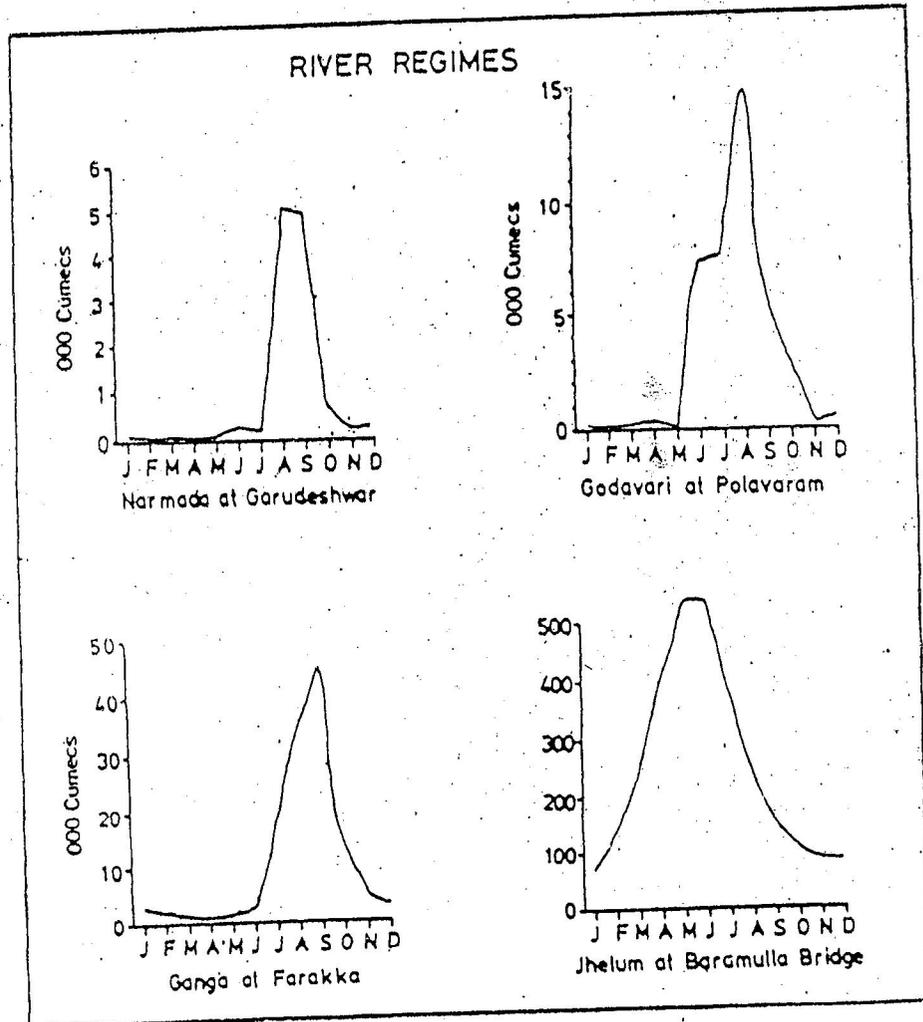


Fig. 8 River Regimes

is the volume of water flowing in a river measured over time. It is measured in units and is called either cusecs (cubic feet per second) or cumecs (cubic metres per second). The Ganga has its minimum flow in the period January-June. The maximum is attained either in August or September. After September there is a steady fall in the flow. The river thus has a typical monsoonal regime. There are, however, striking differences in the river regimes in the eastern and the western parts of the Ganga basin. The Ganga maintains a sizeable flow in the early part of summer before the monsoon rains begin. This is largely due to the water supply from the Himalayan snow-melt. The discharge data, however, do not include the volume of water diverted for irrigation purposes at different points before Farakka. The regime of the Ganga can be compared with that of the Jhelum, another Himalayan river. The Jhelum attains its maximum in June, or even in May, as its flow is mainly caused by the snow-melt from the Himalayas. An interesting difference between the regimes of the two rivers is seen in the range of variation between the maximum and the minimum flow. This difference is sharper in the case of the Ganga than the Jhelum. The mean maximum discharge of the Ganga at Farakka is about 55,000 cusecs, while the mean minimum is only 1,300

cusecs. The Jhelum, however, has a less voluminous discharge, the mean maximum flow being 600 cusecs and the mean minimum 50 cusecs.

The two peninsular rivers display interesting differences in their regimes from the Himalayan rivers. The Narmada has a very low volume of discharge from January to July which suddenly rises in August when the maximum is attained. The fall in October is as spectacular as the rise in August. The Godavari flows at a low level until May. It has a double maxima — one in May-June and the other in July-August. After August there is a sharp fall in water flow, although the volume of flow in October and November is higher than in any of the months from January to May. The mean maximum discharge of the Godavari at Valoparam is 3,200 cusecs, while the mean minimum flow is only 50 cusecs. These figures give an idea of the regime of the river. The flow of water in the Narmada, as recorded at Garudeshwar, shows that the maximum flow is of the order of 2300 cusecs, while the minimum flow is only 15 cusecs.

The data on water discharge in different rivers in different parts of the year have important implications to their utilization by States. It is on this count, that the inter-state disputes arise.

EXERCISES

Review Questions

1. Answer the following questions briefly:

- Name the physiographic units into which India can be divided at the macro level.
- State two important characteristics of the topographic complexity of the Himalaya.

- (iii) What is a horst?
 - (iv) What do you understand by the term "Geosyncline"? What was Tethys?
 - (v) Contrast the relief of the Himalayan region with that of the Indian Plateau.
 - (vi) State two facts in support of the gradual rising of the Himalaya.
 - (vii) Give three pieces of evidence provided by the geologists and archaeologists to prove the very young age of the Himalaya.
 - (viii) Name three high undulating plains in the Himalaya.
 - (ix) What is a "dun"? Give three examples from the Himalayan region?
 - (x) What is a "Bhabar"? Give two important characteristics of a Bhabar belt.
 - (xi) What do you understand by the term "doab"? Give five examples from the Indian sub-continent.
 - (xii) What is the average elevation of the Indian plateau? Name the major physical division of the Indian plateau. Give two important facts about any one of them.
 - (xiii) Name the three main Himalayan river systems.
 - (xiv) What is a gorge? Give two examples.
 - (xv) Where does the river Indus rise? Name its five important tributaries.
 - (xvi) Name two head streams of the Ganga which unite at Devprayag.
 - (xvii) Name two east-flowing rivers of the Peninsular India.
 - (xviii) What is a delta? Give four examples from India.
 - (xix) Name two Indian rivers flowing through trough-faults and have courses consequent to their general trend.
 - (xx) Which peninsular river lacks a developed tributary systems?
 - (xxi) Explain the term Karewas. Where do they occur?
2. Distinguish between:
- (i) Vertical earth movement and Horizontal earth movement
 - (ii) Folding and Faulting
 - (iii) A Gorge and a Rift valley
 - (iv) Bhangar and Khadar
 - (v) East-flowing and west-flowing rivers of the Peninsular India
3. Give one technical term for each of the following:
- (i) An area of relatively level relief and comparatively uniform surface.
 - (ii) A mountain range with a steep scarp-like face on one side and gentle slope on the other.
 - (iii) Crescent-shaped sand dunes.
4. "The major areas of the Himalaya have been formed by folding, while the minor physical features in them have been the result of weathering and other agents of change". Explain this statement with suitable examples.
5. "The present day geomorphological divisions of the subcontinent have evolved in the course of a long geological history". Elaborate this statement.
6. Discuss the main phases of the great mountain building episode which gave rise to the Himalaya. Give examples of the resultant features from each phase.

7. What are the main evidences to suggest the vigorous glacial action in a phased and cyclic manner all over the Himalaya? Discuss with the help of concrete examples.
8. Compare and contrast the geomorphological features of the Himalaya with those of the Indian plateau.
9. Why is Godavari river often referred to as "Dakshin Ganga" or "Vridha Ganga"?
10. Bring out clearly the differences in the drainage features and hydrological characteristics of the Himalayan rivers and the Peninsular rivers. Support your answer with suitable examples.
11. Explain briefly the theory of the "Indobrahm" river as believed by some geologists. Also, mention the two principal grounds on which the theory has been discarded.
12. Illustrating your answer with hydrographs, describe the regime of one Himalayan and one Peninsular river.
13. "Rivers on the western coast of India do not form delta." Why?

Map and Practical Work

14. With the aid of diagrams, explain the difference in appearance and formation of the following:
- (i) Folds and Faults
 - (ii) Anticlines and Synclines
 - (iii) Horst and Trough
 - (iv) Isoclinal folds and Nappe
 - (v) Alluvial Fans and Deltas
15. On the map of the Himalayan region, mark the following and label them:
- (i) Kumaon and Assam Himalayas and the rivers between which they lie.
 - (ii) K2, Nanga Parbat, Nanda Devi, Mount Everest, Kanchenjunga and Namcha Barwa
 - (iii) The ranges of the Karakoram, Kailas, Zaskar, Pir Panjal and Siwaliks
 - (iv) The high altitude plains of Aksai Chin and Tingzi Tang
 - (v) The longitudinal valleys of Dehra Dun and Patli Dun
16. On an outline map of India mark the following and label them:
- (i) The rivers — Ganga, Indus, Kosi, Brahmaputra, Damodar, Narmada, Tapi, Godavari, Krishna and Kaveri
 - (ii) The plateaus — Malwa, Chhotanagpur and Shillong
 - (iii) The ranges — Vindhya, Satpura, Aravali, Nilgiri, Anamalai and Cardamom.
 - (iv) The Palghat gap and the Shencottah gap
 - (v) The Coromandel coastal plain, the Chhattisgarh plain and the Vidarbha plain

CHAPTER 3

Climate

THE CLIMATE of India can be described by just one word: and that word is monsoon. The word conveys comprehensively the idea of the rhythm of seasons and the changes that occur in the direction of winds. These changes lead to the changes in the seasonal distribution of rainfall and temperature. Derived from the Arabic word *mausam*, monsoon implies a seasonal reversal in the wind direction through the year. These alternations are a distinguishing feature of the monsoon type of climate so characteristic of the entire region of South and South-east Asia. The monsoon regime emphasises the unity of India with the rest of the South-east Asian region.

This view of the broad unity of the monsoon type of climate should not, however, lead one to ignore the regional variations in climate which differentiate the weather and climate of different regions of India. For example, the climate of Kerala and Tamil Nadu are so different from that of Uttar Pradesh and Bihar, and yet all of them have a monsoon type of climate. The climate of India has many regional variations expressed in the pattern of winds, temperature and rainfall, rhythm of seasons and the degree of wetness or dryness. These differences in the climatic characteristics are caused by many factors, such as location, altitude, distance from

the sea, the distance from the mountains and the general relief. These diversities are only regional facets. They may be described as sub-types of monsoon climate. The monsoon regime thus emphasises the basic climatic diversity within the unity of the sub-continent.

Let us have a closer look at these regional variations in temperature, wind and rainfall. Barmer in Rajasthan may record a temperature of 48°C or even 50°C on a June day, while the mercury hardly touches 22°C at Gulmarg or Pahalgam in Jammu and Kashmir on the same day. On a December night people in Dras and Kargil, in Jammu and Kashmir, shiver with freezing cold — the minimum temperature being as low as -40°C while Thiruvananthapuram or Chennai record +22°C or +22°C. These differences are equally striking in rainfall patterns as well. Cherapunji receives a total rainfall of 1,080 cm over the year, while the annual rainfall at Jaisalmer rarely exceeds 12cm. Tura in the Garo Hills, may get in a single day an amount equal to 10 years of rainfall at Jaisalmer.

The Ganga delta and the coastal plains of Orissa are hit by strong rain-bearing storms almost every third or fifth day in July and August, while the Coromandel coast, a thousand kilometres to the south goes generally dry during these months

CLIMATE

When the Kashmiri peasant shivers with cold inside his pheran, the peasants of the Kerala coast work in a loin-cloth in their fields. The Brahmaputra valley experiences floods in July but the Rajasthani peasant may sit cross-legged on the parched earth looking at the cloudless sky.

The people of Mumbai and the Konkan coast have hardly any idea of the extremes of temperature and the seasonal rhythm of weather. On the other hand, the seasonal contrasts in weather at places in the interior of the country, such as Agra, Patna and Bhopal affect the entire sphere of life. These contrasts have given rise to variations in the way of life of our people particularly in the way they dress themselves or the food habits they have developed. Similarly, there are differences in the onset and the withdrawal of the summer monsoon rains in different parts of the country. Places like Goa, Hyderabad, Bhubaneswar and Patna get rains by the first quarter of June, while the rains might still be eagerly awaited at Agra, Delhi and Chandigarh.

Mechanisms of Weather : Pressure and Winds

These differences in local climates are an outcome of a number of factors. This mechanism is of great significance to the understanding of Indian weather. Broadly speaking these factors reveal themselves in:

1. surface distribution of pressure and wind;
2. upper air circulation caused by factors controlling global weather and the inflow of different air masses and jet streams; and
3. inflow of western disturbances during the winter months and the tropical depressions during the South-west monsoon period into India creating weather conditions favourable to rainfall.

These mechanisms can be described with reference to the two main seasons of the year, i.e. winter and summer seasons. Striking changes in weather occur during the two seasons. The weather conditions during the winter months over India are generally influenced by the distribution pattern of pressure in Central and Western Asia. A high pressure centre in the region lying to the north of the Himalayas gives rise to the flow of air at the low level from the north towards the Indian sub-continent south of the mountain range. It is the dry continental air which is experienced in the north-western part of the Indian Plain during the winter months. The surface winds blow out of the high pressure centre over Central Asia reaching India in the form of a dry continental air-mass. The weather maps for this part of the year show a zone of contact which lies over north-western India. The north-westerly continental air comes in contact there with the trade winds. The position of this contact zone is not, however, stable. Occasionally, it may shift its position as far east as the middle Ganga valley with the result that the whole of the north-western and northern India up to the middle Ganga valley comes under the influence of dry north-western winds (see Fig. 9).

This pattern of air circulation is seen only at the lower level of the atmosphere near the surface of the earth. Higher up in the lower troposphere, about three kilometres above the surface of the earth, a different pattern of air circulation is observed. The variations in the atmospheric pressure closer to the surface of the earth have no role to play in its making. The whole of Western and Central Asia remains under the influence of westerly winds at this altitude. They blow with a steady velocity across the Asian continent at latitudes north of the Himalayas roughly parallel to the Tibetan

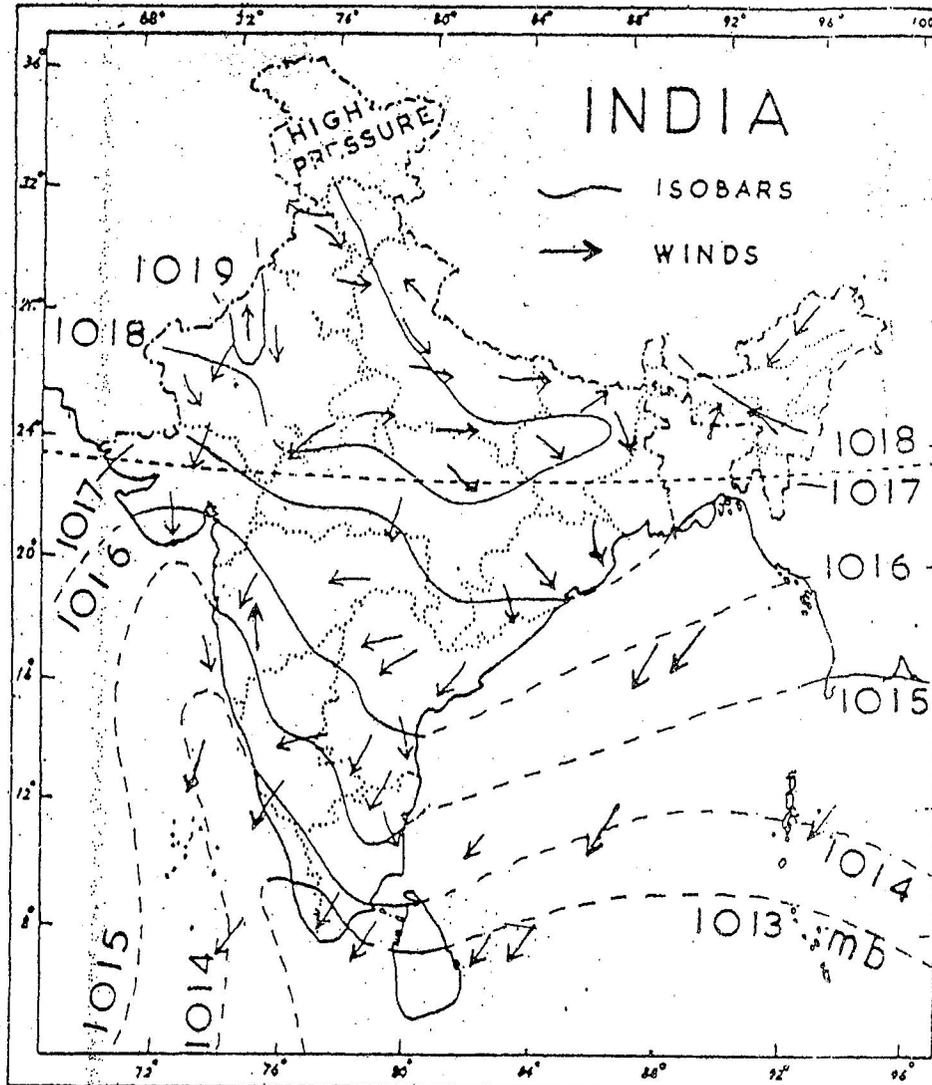


Fig. 9 India—Pressure and Surface Winds (January)

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 The boundary of Meghalaya shown on this map is as interpreted from the North-Eastern Areas (Reorganisation) Act, 1971, but has yet to be verified.

highlands which act as a barrier in their path. As a result of this current the westerly wind, known as the jet stream, gets bifurcated by the obstruction posed by these highlands. One branch of the jet stream flows to the north of the Tibetan highlands. A southern branch of the jet stream flows in an eastward direction south of the Himalayas. It has its mean position at 25°N in February at 200 to 300 millibar level. The weather scientists believe that this southern branch of the jet stream exercises an important influence on the winter weather in India. The western disturbances which enter the Indian sub-continent from the west and the north-west during the winter months are brought into India by the westerly jet stream. These disturbances normally occur to the east of the westerly jet stream. An increase in the prevailing night temperature generally indicates in advance, the arrival of these disturbances.

As the summer sets in and the sun shifts northwards the wind circulation over the sub-continent undergoes a complete reversal at both the levels, lower as well as the upper. Nearer the surface, the Low Pressure Belt, which may be termed as Inter-Tropical Convergence Zone (ITCZ) forms an important zone of contact over Northern India and Pakistan roughly parallel to the Himalayas. By the middle of July this zone of low pressure lies over India about 25° N. By this time the westerly jet stream withdraws from the Indian region. In fact, an interrelationship has been observed between the northward shift of the equatorial trough and the withdrawal of the westerly jet stream from over the North Indian Plain. It is generally believed that there is a cause and effect relationship between the two, although all the parameters of this relationship are not fully known. The ITCZ, being a zone of low pressure, invites inflow of winds from

different directions. The maritime tropical air (MT) from the southern hemisphere, after crossing the Equator, rushes to the low pressure area in a general south-westerly direction. It is this moist air current which is popularly known as the south-west monsoon. Some scholars are of the view that the south-west monsoon, in fact, is a continuation of the equatorial westerlies which flow into the northern latitudes under the influence of the ITCZ. An easterly current of the tropical maritime air converges on the ITCZ along its north-eastern margins. The north-western margin, on the other hand, becomes a zone of convergence and subsidence for the dry continental air from the north-west (see Fig. 10).

The above pattern of the pressure and winds is found only at the lower level. The circulation pattern at the level of the troposphere is altogether different from this. An easterly jet stream flows over Northern India at 150 millibar level. Like the westerly jet stream, which prevails over the North Indian Plain during the winter months, the easterly jet stream steers the tropical depressions into India. These depressions play a very significant role in the distribution of monsoon rainfall over the Indian sub-continent. The highest rainfall occurs along the track of these depressions. The frequency at which these depressions visit India, their direction and intensity, all go a long way in determining the rainfall pattern during the south-west monsoon period.

Indian Monsoon

The weather conditions prevailing over the Indian sub-continent during the winter and summer months, discussed briefly in the above paragraphs are all aspects of a climatic regime known as the Indian monsoon. A brief introduction to the monsoon, its distinguishing characteristics

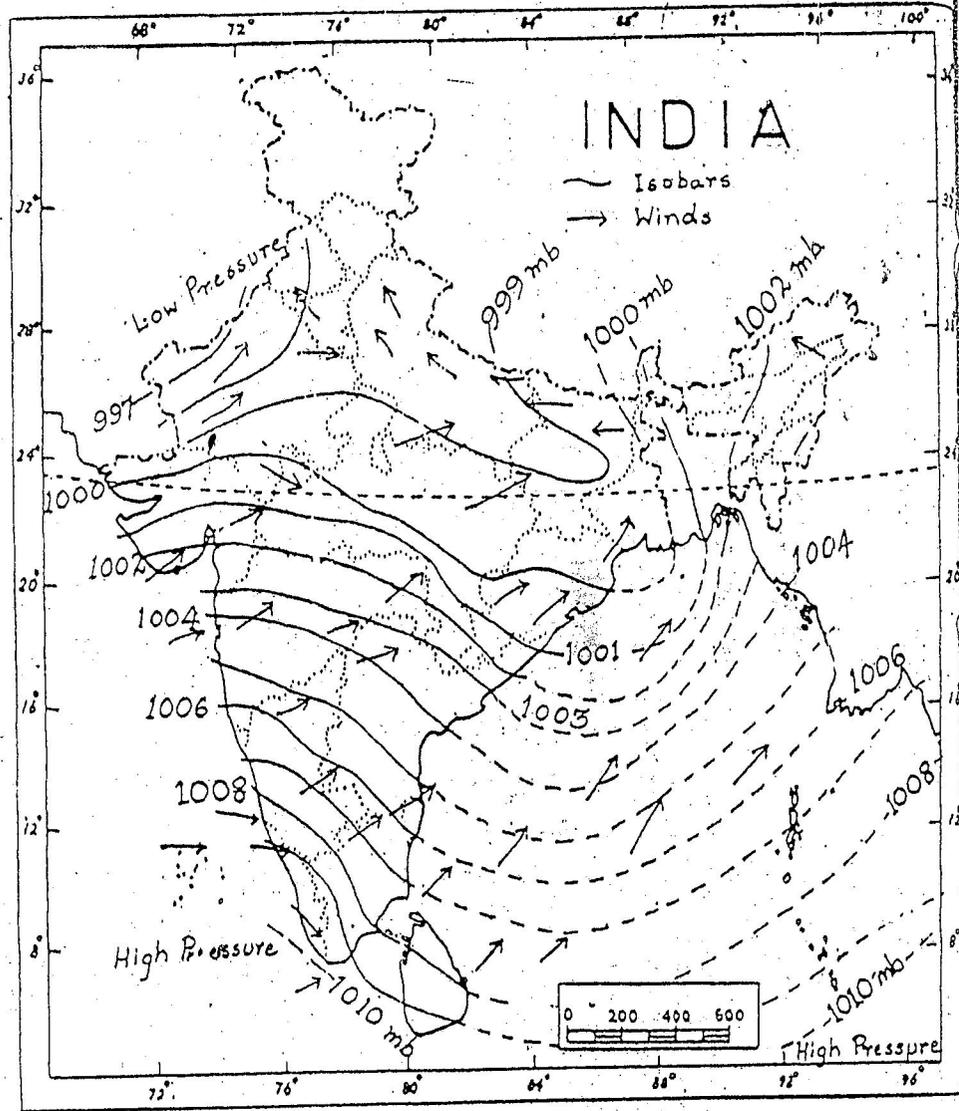


Fig. 10 India—Pressure and Surface Winds (July)

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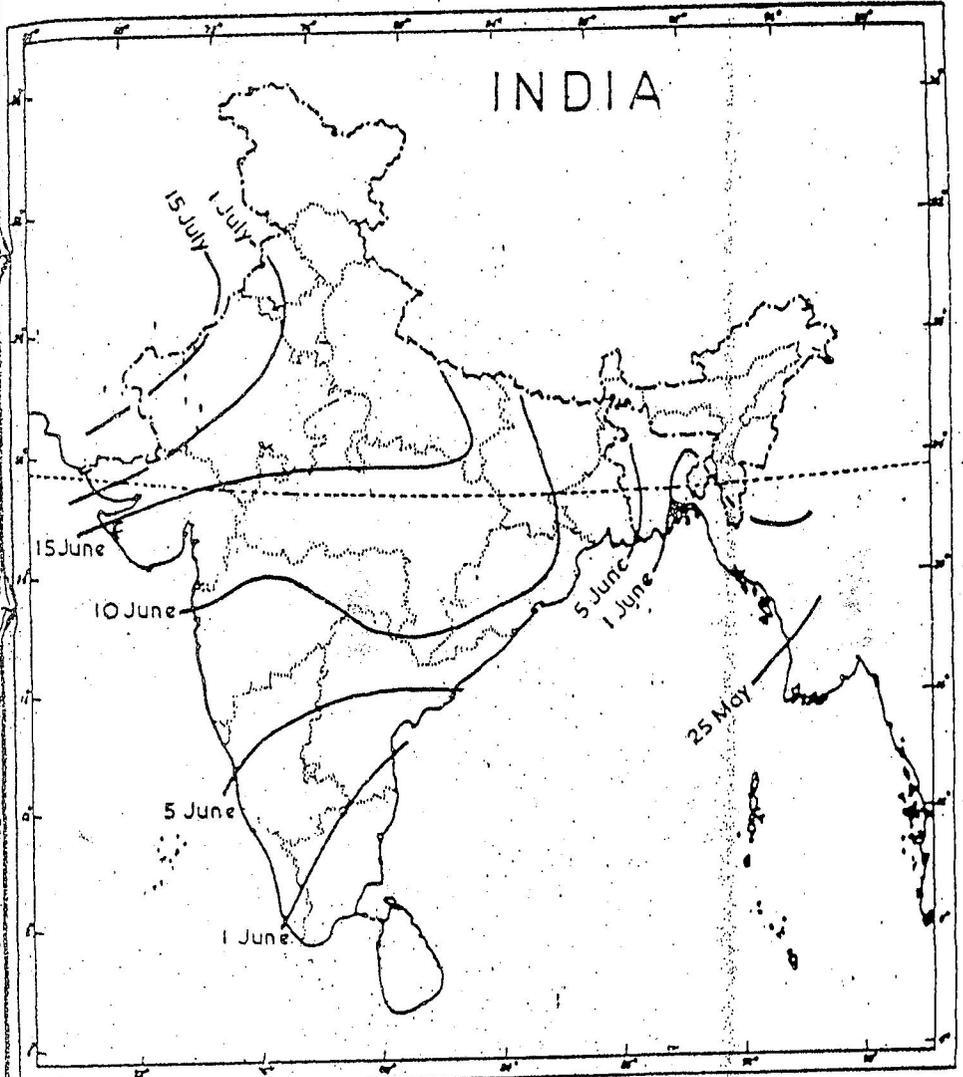


Fig. 11 India—Onset of South-West Monsoon

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and its genesis may be of some help in understanding the Indian weather.

Monsoon is a familiar, though little known, climatic phenomenon. For the people of India, monsoons are harbingers of rain. The Seamen observe them as a system of trade winds in the Arabian Sea. To a meteorologist monsoons imply a complete reversal in the direction of the prevailing wind between January and July over the Indian sub-continent. However, despite observations spread over centuries, the phenomenon of monsoon continues to puzzle the scientists.

Many attempts have been made to understand the mechanism of monsoon. An earlier view was that the monsoons are mainly caused by the differential heating of land and sea and the contrasts in atmospheric pressure result in the formation of a wind which blows from the sea (an area of relatively high pressure) to the land (an area of relatively low pressure). This explanation of the monsoon was offered towards the end of the nineteenth century. However, it was obviously simplistic and rather inadequate and the search for a satisfactory theory of the origin of monsoon continued.

Systematic studies of the causes of rainfall in the South Asian region help to understand the monsoon phenomenon, particularly, some of its more important aspects such as:

- (a) the onset and landward advance of monsoon;
- (b) rain-bearing systems (e.g., tropical cyclones) and the relationship between their frequency and distribution of monsoon rainfall;
- (c) break in the monsoon (implying a spell of dry weather); and
- (d) the retreat of the south-west monsoon and the onset of the north-east monsoon.

Onset of the Monsoon

The onset of south-west monsoon is a highly complex phenomenon and there is no single theory which can explain it fully. As pointed out earlier, it is still believed that the differential heating of land and sea during the summer months is the mechanism which sets the stage for the monsoon winds to drift towards the sub-continent. The large landmass to the north of the Indian Ocean gets intensely heated during April and May. This causes the formation of an intense low pressure in the north-western part of the sub-continent. Since the pressure in the ocean to the south of the landmass is high, the low pressure cell attracts the south-east trades across the Equator. These conditions are favourable for a northward shift in the position of the ITCZ (Inter-Tropical Convergence Zone). The south-west monsoon may thus be seen as a continuation of the south-east trades deflected towards the Indian sub-continent after crossing the Equator. The data collected during the Monsoon Expedition (MONEX) in 1979 revealed that the south-east trades normally crossed the Equator between 40°E and 60°E.

Thus, one may conclude that the establishment of low pressure over the north-western part of the Indian sub-continent has some link with the northward shift of the ITCZ. These forces together play a significant role in causing the south-east trades cross the Equator and reach the west coast as the south-west current of the monsoon.

As you have noted earlier the shift in the position of the ITCZ is also related to the phenomenon of the withdrawal of the westerly jet stream from its position over the North Indian Plain, south of the Himalayas. The easterly jet stream sets in only after it has withdrawn itself from the

region. However, as stated earlier the nature of this relationship is highly complex and can be understood with the help of a theory.

According to this theory the easterly jet stream owes its origin to the summer heating of the lower atmosphere above the Tibetan highlands. These highlands occupy a vast area of about 4.5 million square kilometres with an average altitude of over 4,000 metres. With the northward shift in the position of the sun, the air above these highlands is heated. This is a significant feature particularly when compared with the air at this altitude in the region surrounding the Tibetan Highlands. The radiation from this elevated landmass gives rise to a clockwise circulation in the middle troposphere. The two streams of air flowing out of this landmass at the tropospheric level take opposite directions. One of them flows towards the Equator probably to replace the air that crosses the Equator at the surface level, while the other is deflected towards the Pole. The Equatorward flow from these highlands prevails over India as the easterly jet stream, while the poleward outflow prevails over East-Central Asia as the westerly jet stream. It may be noted that the easterly jet stream continues to flow over Central Asia even during the summer months. The above discussion shows that the Himalayan and the Tibetan highlands have an important role to play in meteorological conditions leading to the development of the south-west monsoon. Besides, the easterly jet stream steers into India the rain-bearing storms (tropical cyclones) which cause widespread rainfall.

The south-west monsoon engulfs the entire sub-continent by mid July. It sets in over the Kerala coast by 1st June and moves swiftly to reach Bombay (now Mumbai) and Calcutta between 10, and 13 June (see Fig. 11).

Rain-bearing Systems and Rainfall Distribution

To a layman monsoon is synonymous with rainfall. However, the monsoon rain is never continuous. It comes in spells. The wet spells are not continuous and often breaks take place in their continuity. Thus, wet spells are followed by dry spells. The tropical depressions originating in the Bay of Bengal, or further east in the South China Sea, cause rainfall over the plains of north India. On the other hand, the Arabian Sea current of the south-west monsoon brings rain to the west coast of India. Much of the rainfall is orographic as the moist air rises along the Western Ghats. The intensity of rainfall over the West coast of India is, however, related to the offshore meteorological conditions and the position of the equatorial jet stream along the eastern coast of Africa.

The frequency of the tropical depressions originating from the Bay of Bengal varies from year to year. Their tracks over India are mainly determined by the position of ITCZ, which is generally termed as the monsoon trough in Indian meteorological literature. As the axis of the monsoon trough oscillates, the tracks of these depressions also vary. This causes wide fluctuation in the direction and the paths these depressions take. Intensity of rainfall as well as the variations in the amount of rainfall from year to year. The rains display a declining trend from west to east-north-east over the west coast and from the east-south-east towards the north-west over the North Indian plain and the northern part of the peninsula.

Break in the Monsoon

During the south-west monsoon period long dry spells are quite common. During these dry periods, rains fail to occur for one, two or more weeks. Such a phenomenon is known as a break in the

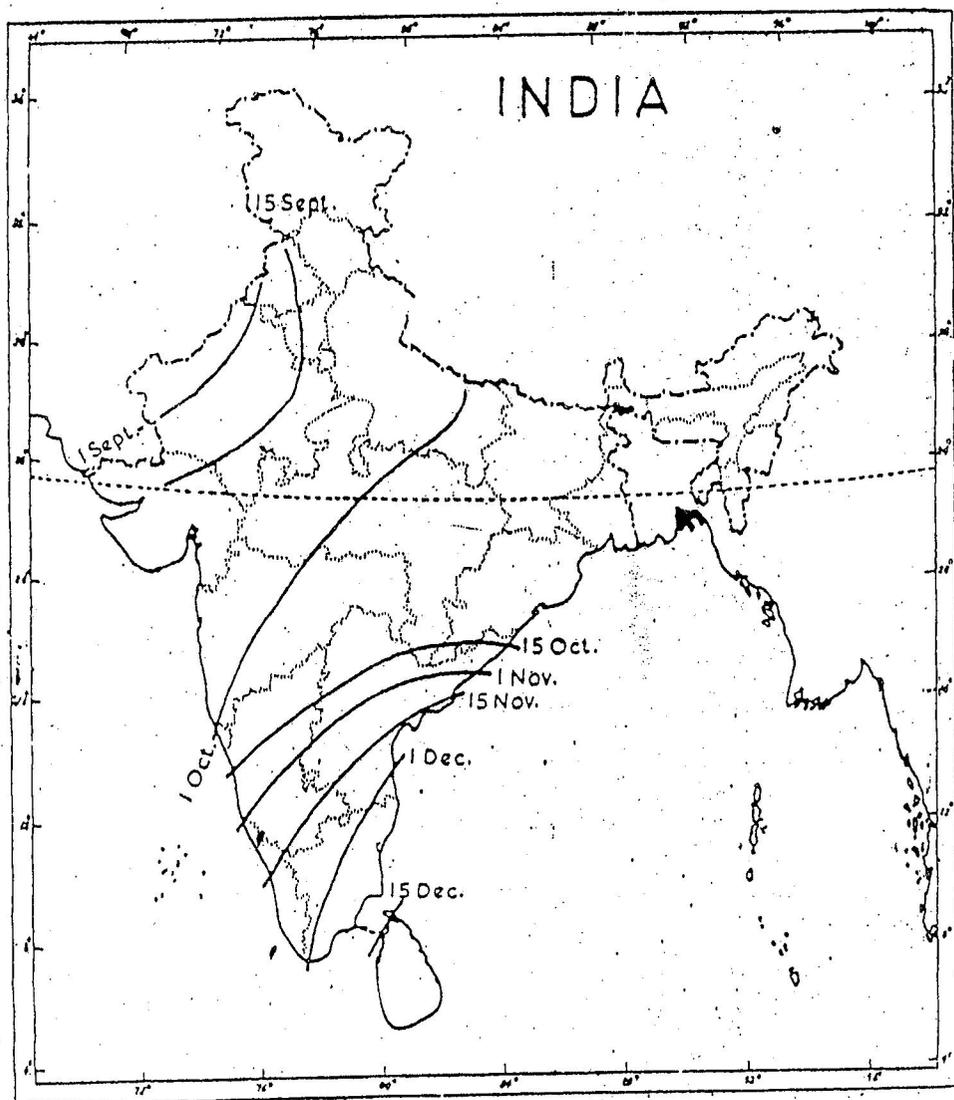


Fig. 12 India—Withdrawal of South-West Monsoon

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The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate baseline.

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monsoon. These breaks may be due to several reasons. The rains are likely to fall if the rain-bearing storms (the tropical cyclones) are not very frequent. The failure is also related to the position of the rcz or the monsoon trough over northern India. Over the west coast the dry spells are associated with days when winds blow parallel to the coast. On the other hand, the dry spells occur over western Rajasthan due to the thermal conditions in the lower atmosphere. These conditions cause what is known as an inversion of temperature which prevents the rain-bearing winds from rising up.

The Retreat of Monsoon

The monsoon starts retreating from north-west India by September. Normally, it withdraws itself completely from the region, except the southern peninsula by mid-October. The retreating monsoon picks up moisture from the Bay of Bengal and establishes itself over the Tamil Nadu coast and the east coast of Sri Lanka as the north-east monsoon. (see Fig. 12).

Rhythm of Seasons

The monsoon type of climate is characterised by a distinct seasonality. It will be interesting to examine the characteristic features of the seasonal weather in India. These weather conditions reveal themselves in spectacular changes in temperature as well as rainfall from season to season.

The meteorologists usually recognise the following four seasons :

- cold weather season;
- hot weather season;
- south-west monsoon season; and
- the season of retreating monsoon.

These seasonal changes are more peculiar in the interior parts of the country, particularly the northern and the northwestern regions. So far as the coastal

regions are concerned there are no significant seasonal changes in temperature, although rainfall has a distinct seasonal pattern.

Cold Weather Season

Usually the cold weather season sets in by mid-November in northern India. January and February are the coldest months. The mean daily temperature remains below 21°C over most of northern India. The night temperature may be quite low, often going below the freezing point. The weather in this season is characterised by feeble high pressure conditions over the north-western part of the Northern Plain. The temperature remains quite low during the winter months over the Indian sub-continent. The coastal areas have moderate temperatures throughout the year and do not register any significant seasonal change. December and January are the coldest months in the interior parts of the country, with mean daily maximum temperature varying from 28°C in the Peninsular to 19°C in the north-west. The mean daily minimum temperatures during the winter months show a great diversity. They vary from 24°C in the Peninsular to 5°C in the north-western part of the country. The night temperatures sometimes go down below the freezing point. Such periods of unusually cold weather are generally described as 'cold waves'.

The Peninsular region of India, however, does not have any well-defined cold weather season. As noted earlier there is hardly any seasonal change in the distribution pattern of temperature in coastal areas because of the influence of the sea. The mean maximum temperature for January at Thiruvananthapuram is as high as 31°C . The mean maximum temperature for June is 29.5°C (see Fig. 13).

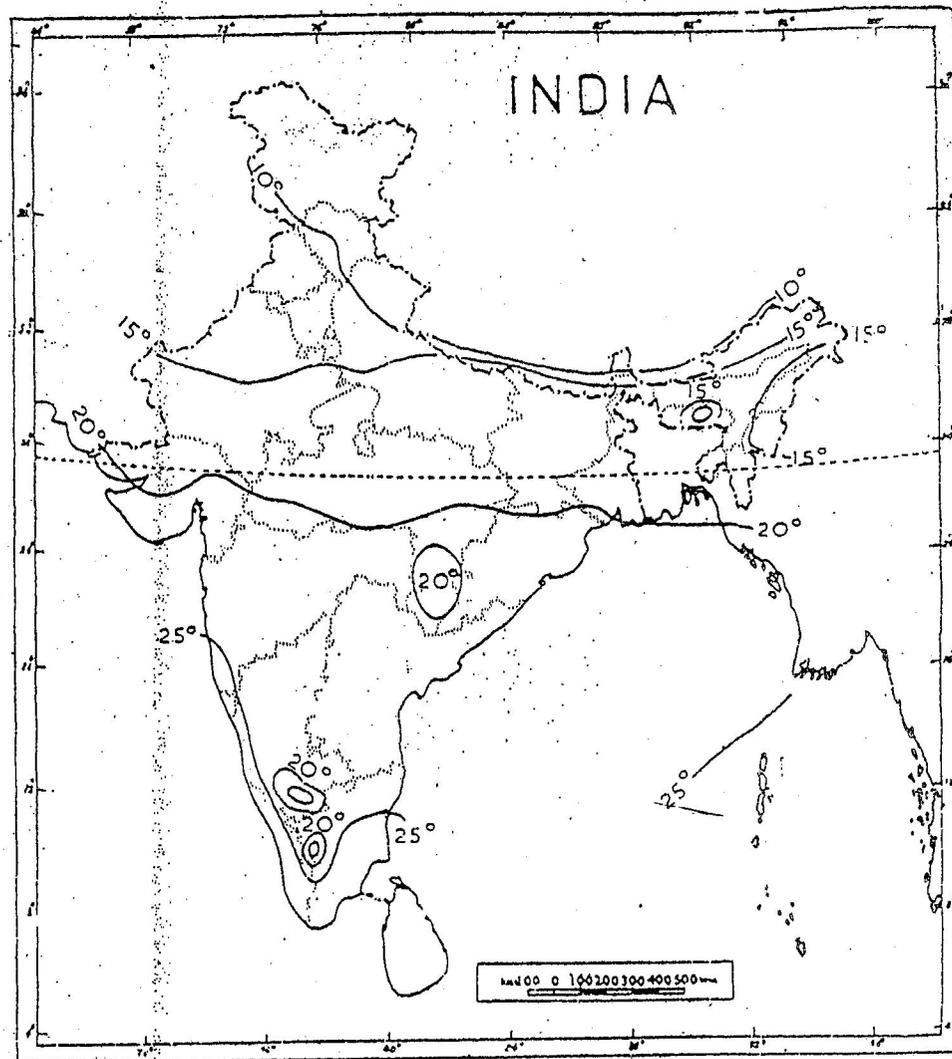


Fig. 13 India—Isotherms (cold weather) (Temperature in °C)

Based upon Survey of India map with the permission of the Surveyor General of India.

The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.

The boundary of Meghalaya shown on this map is as interpreted from the North-Eastern Areas (Reorganisation) Act, 1971, but has yet to be verified.

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A characteristic feature of the cold weather season over the north Indian Plain is the inflow of depressions from the west and the north-west. These low pressure systems, called the western disturbances, originate in West Asia and the regions near the Mediterranean Sea. They travel eastwards across Iran and Pakistan and reach India during the winter season. You have already noted that the westerly jet stream plays a key role in steering these depressions into India. On an average, four or five such depressions visit India in each of the winter months. They are generally active between December and February. They cause the much-needed winter rainfall over the plain areas of the north-western region of India. The precipitation is in the form of snowfall in the lower Himalayas. The rainfall caused by the western disturbances decreases from north and north-west to the east. The average rainfall during the three months of December, January and February at Delhi is around 53 mm. Between Punjab and Bihar, rainfall remains between 18 and 25 mm. Though the amount of winter rainfall is small, its importance to the rabi crops cannot be over-emphasised. In areas where the irrigation is still not developed, winter rains are a blessing for the farmer. The north-eastern part of India also gets some rainfall during the winter months. Arunachal Pradesh and Assam may get on an average as much as 50 mm of rainfall during these months.

The Tamil Nadu coast is a notable exception in the sense that the bulk of its rainfall is received during October and November. It is caused by the north-east monsoon. The rainfall regime of Tamil Nadu coast has, therefore, a distinct individuality of its own.

Hot Weather Season

The north Indian region experiences an

intensely hot weather season during the months of April, May and June. Temperatures start rising by the middle of March and by mid-May the mercury may touch 41°C to 42°C. A striking feature of the hot weather season is the Loo. These are strong hot winds blowing during day time over northern and north-western India. The heat of the day is, however, generally reduced by the locally formed dust storms. The mean daily maximum temperature for the month of May at Delhi is as high as 41.2°C. The mean daily minimum temperature during the summer months also remains quite high and rarely goes below 26°C. There are, however, variations in the pattern of day temperatures from region to region. At some places particularly in northwestern India, over parts of Rajasthan and Haryana day temperatures may be as high as 45°C or even 50°C.

As noted earlier, because of this heating of the sub-continent the *mex* moves northwards occupying a position centred at 25°N in July. The location of the *mex* attracts a surface circulation of the winds which are south-westerly on the west coast as well as along the coast of West Bengal and Bangladesh. They are easterly or south-easterly over North Bengal and Bihar. You have already noted that these currents of south-westerly monsoon are really "displaced" equatorial westerlies. The influx of the south-westerly monsoon by mid-June brings about a change in the weather towards the rainy season (see Fig. 11).

The hot weather season over the southern parts of India is very mild. The highest temperature is recorded during the months of March, April and May. In March, the mean maximum temperature generally exceeds 35°C at places south of Madhya Pradesh. In April, it exceeds 37°C at places in northern India from Punjab to Bihar. In

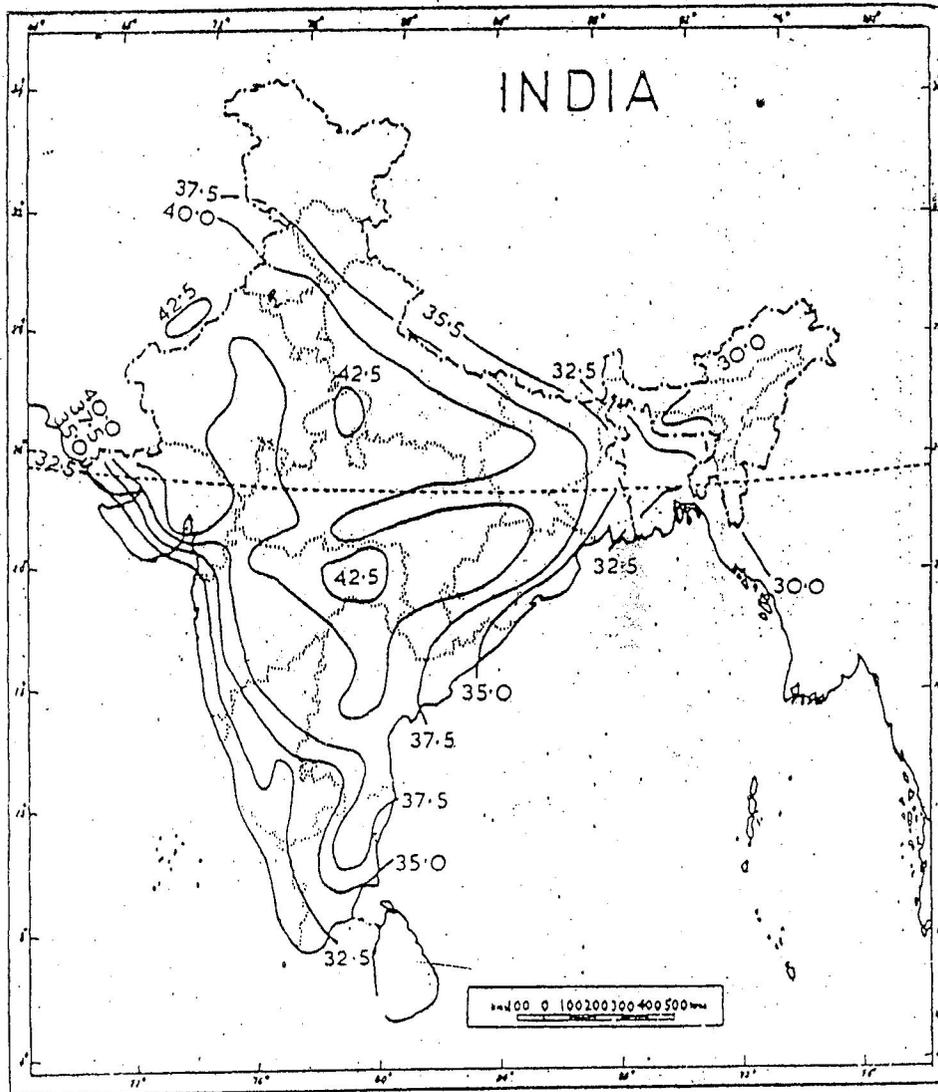


Fig. 14 India—Mean Maximum Temperature (May) (Temperature in °C)

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The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.

The boundary of Meghalaya shown on this map is as interpreted from the North-Eastern Areas (Reorganisation)

Act, 1971, but has yet to be verified.

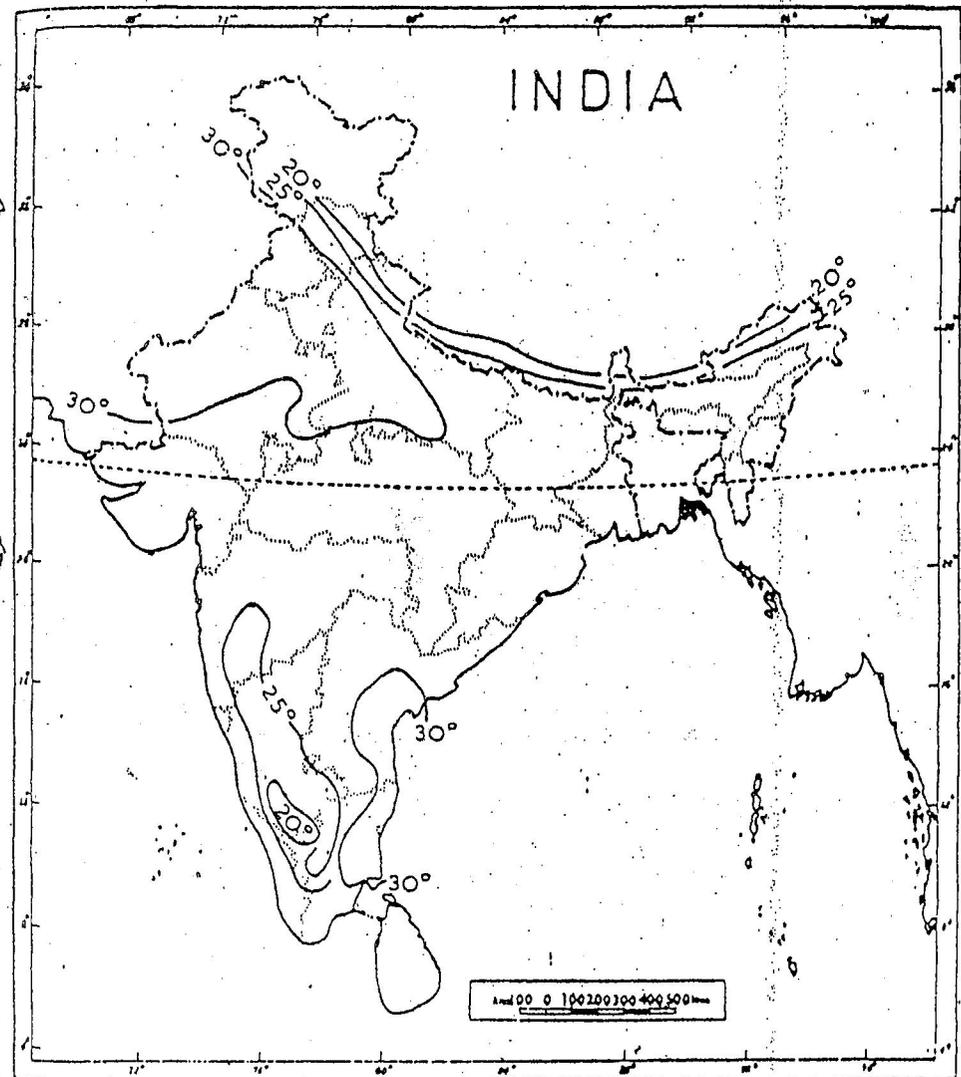


Fig. 15 India : Isotherms (hot weather) (Temperature in °C)

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The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.

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Act, 1971, but has yet to be verified.

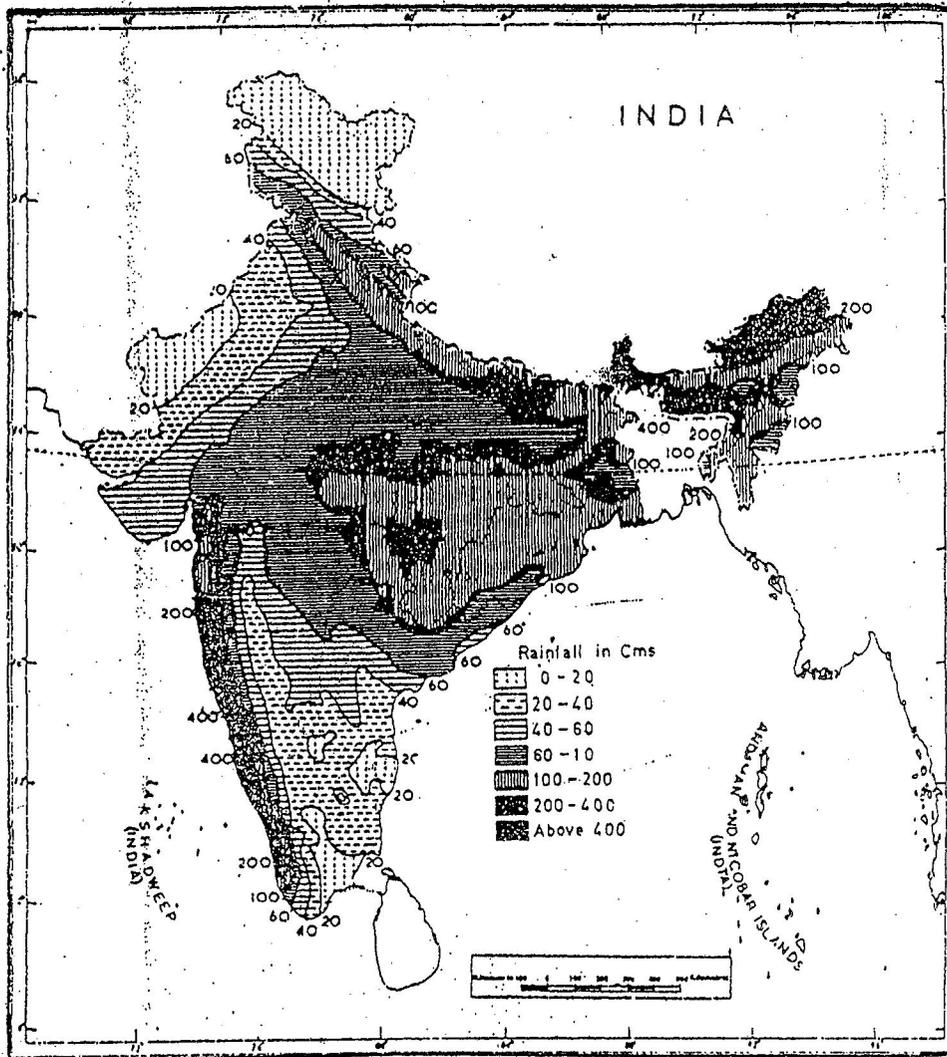


Fig.16 India : Rainfall (South - West Monsoon)

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The boundary of Meghalaya shown on this map is an improvement from the North-Eastern Area (Reorganisation) Act, 1957, but has yet to be certified.

The horizontal waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.

May, temperature is very high over places in the north-west and in central India. Even the mean minimum temperature does not go below 20°C (see Figs. 14 and 15). On a hot day the absolute night temperature may be as high as 30°C.

The hot weather season over north India is generally dry but not rainless. The locally formed dust storms and thunder storms bring some amount of rainfall. On an average Delhi receives 20mm of rainfall during the two months of April and May. The total rainfall of the hot weather season is generally less than 25mm over Rajasthan, Gujarat and Madhya Pradesh. It varies from 100 to 500mm in the sub-Himalayan districts of north-western India, Uttar Pradesh, Bihar, West Bengal, Orissa and over the greater part of the Peninsula. It is more than 250mm in Kerala and over 500mm in Assam.

The Season of Rains

The inflow of south-westerly monsoon into India brings about a total change in weather. The monsoon winds come in two main currents. They are known as the Arabian Sea and the Bay of Bengal currents. The rains begin rather abruptly. One result of the first rain is that it brings down the temperature substantially. This sudden onset of rain is often termed as the 'monsoon burst.' The monsoon may burst in the first week of June or even earlier in the coastal areas, while in the interior parts of the country, it may be delayed to the first week of July. The day temperatures register a decline of 5°C to 8°C between mid-June and mid-July.

With the onset of rains, temperature starts falling although June is extremely hot at most places in northern India. A second maxima is recorded in September when the mean maximum temperature over most of northern India remains quite high. The mean maximum temperature at

Delhi in September and October remains above 35°C (see Fig. 15).

The distribution pattern of rainfall over the year reveals interesting diversities in India. These regional patterns are of great importance to us as they determine the timing of agricultural operations in different parts of the country.

The Indian sub-continent receives bulk of its rainfall during the south-west monsoon period (see Fig. 16). The Arabian Sea current causes rainfall all along the west coast, Western Ghats, Maharashtra, Gujarat and parts of Madhya Pradesh. It merges with the Bay of Bengal current over the Punjab and the Himachal Pradesh. The Bay of Bengal current, on the other hand, strikes at the West Bengal coast and the southern slopes of the Shillong plateau. It is, however, deflected towards the west and north-west moving over the North Indian Plain by and large parallel to the axis of the Himalayas. The amount of rainfall is the highest along the west coast of India. It is also very high in the north-eastern region (Assam, Meghalaya, Manipur and other states). The average rainfall over the north Indian Plain generally remains between 1000 and 2000mm during this period. The monsoon rainfall is characterised by a declining trend with increasing distance from the sea. Calcutta receives 1190mm during the south-west monsoon period; Patna 1050mm; Allahabad 760mm and Delhi 560mm.

Another phenomenon associated with the south-west monsoon is its tendency to have 'breaks' or spells of dry weather. These breaks in rainfall are related to the fluctuations in the influx of tropical depressions. The amount as well as the intensity of monsoon rainfall is, therefore, determined by the frequency of these depressions. The rainy season comes to an end by the first week of September over most of northern India.

The eastern coast of India, particularly the Tamil Nadu coast remains relatively dry during the south-west monsoon period. This is because of the location of Tamil Nadu coast. The Bay of Bengal current flows parallel to the coast and is a relatively dry wind.

The Season of Retreating Monsoon

The south-west monsoon starts retreating from northern India by the second week of September. Unlike its sudden burst, the retreat of the monsoon is gradual. Moreover, the pattern of retreat has significant regional variations. The weather during this season is characterised by high day temperatures, but the nights are pleasant with the mean minimum temperature going down to 20°C or even lower. The diurnal range of temperature is, however, quite pronounced. During this season several cyclonic storms develop in the Bay of Bengal, which move from the north-east to the south-west causing substantial amount of rainfall on the coast of Tamil Nadu and Sri Lanka.

Traditional Indian Seasons

The meteorological division of the year described above has little meaning for the people of India. The cycle of seasons, the common people follow is based on their practical experience and age-old perception of the weather phenomena. The Indian tradition, particularly in the north, recognises a two-monthly cycle of seasons. According to the Indian convention, the

year is divided into the following six seasons (*ritus*).

The *Vasanta* is the first season of the year and roughly corresponds to the spring. The season, however, does not fully coincide with the months of March and April as it extends over the period of mid-February to mid-April. The *Vasanta* is replaced by *Grishma* (summer) occurring during *Jyaistha* and *Asadha* (mid-April-mid-June). The *Varsha Ritu* (rainy season) of the Indian tradition extends over *Sravana* and *Bhadra* (July-August). The rainy season may, however, set in by the middle of May and June and continue up to the middle of September with marginal variations in different parts of the country.

The *Sharada ritu* occurs in *Asvina-Kartika* (mid-September-mid-November). However, there is no clear distinction between the *Sharada* and the following *Hemanta* (*Margashirsa-Pausa*) except that the cold weather is rigorous during the latter. The *Sharada* is clearly transitional between the *Varsha* and the *Hemanta*.

The *Hemanta* is followed by the *Shishira* and occurs in *Magha* and *Phalguna* (January-February). During *Shishira* the cold weather gradually gives way to the spring (*Vasanta*) itself transitional to summer (*Grishma*).

It is interesting to note that this view of season holds good in the northern and the central parts of India. There are some variations in seasons in the southern region of the peninsula.

Seasons	Months (according to Indian Calendar)	Months (according to English Calendar)
Vasanta	Chaitra-Vaisakha	March-April
Grishma	Jyaistha-Asadha	May-June
Varsha	Sravana-Bhadra	July-August
Sharada	Asvina-Kartika	September-October
Hemanta	Margashirsa-Pausa	November-December
Shishira	Magha-Phalguna	January-February

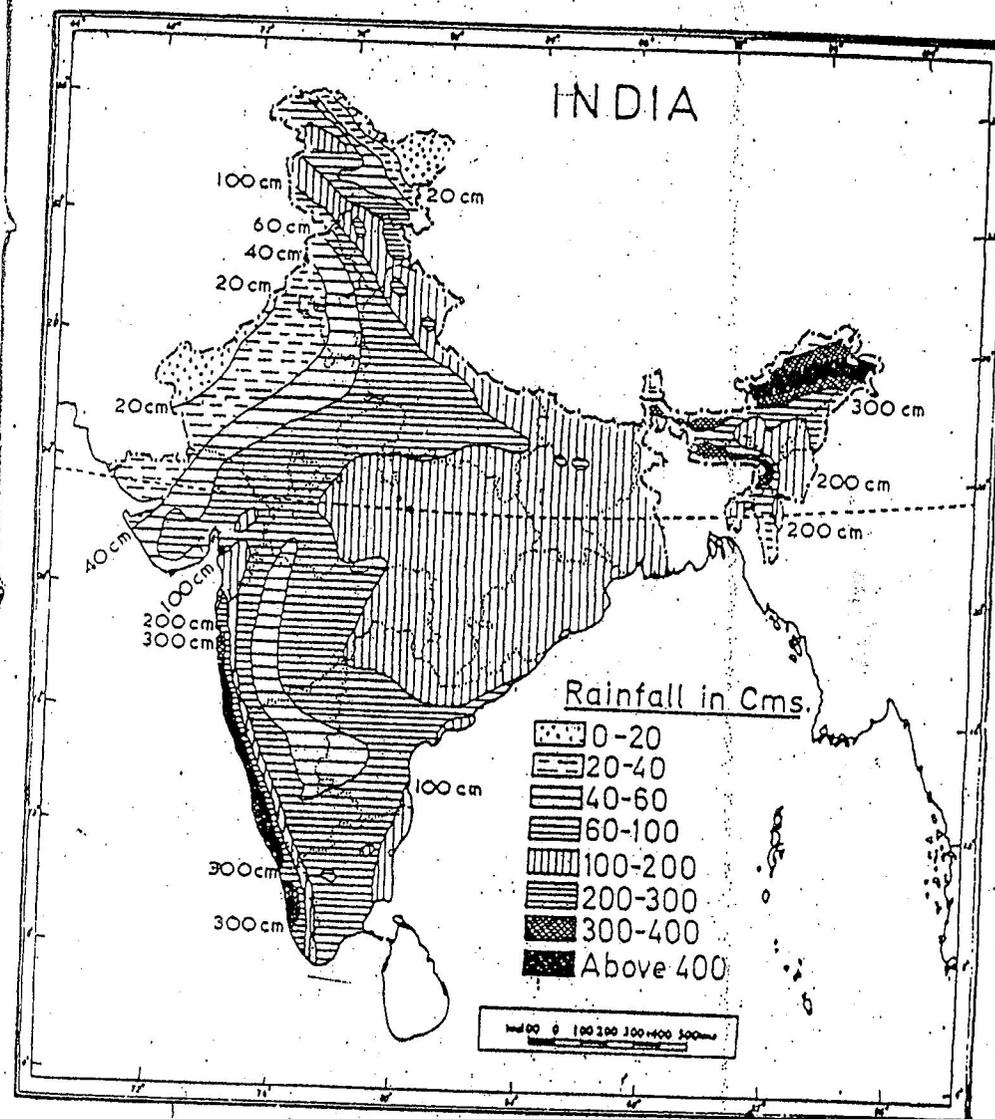


Fig. 17 India—Average Annual Rainfall

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Annual Rainfall and its Variability

The regional variations in the distribution of annual rainfall are quite pronounced, and deserve a special mention (see Fig. 17). The highest rainfall occurs along the west coast, on the Western Ghats, as well as in the sub-Himalayan areas in the north-east and the hills of Meghalaya. Here the rainfall exceeds 2000mm in a year. In certain parts of the Khasi and Jaintia Hills the rainfall exceeds 10,000mm. Mawsynram this region receives the highest rainfall in the world. It, however, drops to 2000mm or even below in the Brahmaputra valley and the adjoining hills. The 1000mm isohyet runs southwards from the Gujarat coast, roughly parallel to the crest of the Western Ghats up to Kanyakumari. The rainfall over the peninsular regions lying to the east of this line drops abruptly to below 600mm. The east coast in Tamil Nadu gets a little higher rainfall of above 1000mm. To the north, the 1000mm isohyet trends eastwards passing over the southern parts of Jammu and Kashmir, Himachal Pradesh and northern Uttar Pradesh. To the east of Allahabad, it bends to the west and passes over Bundelkhand in Uttar Pradesh. Turning west-south eastwards it runs over western Madhya Pradesh, eastern Maharashtra and northern Andhra Pradesh. The regions lying to the west-southwest of this line have low rainfall. Successful agriculture in this belt largely depends on irrigation. The rainfall over parts of Punjab, Haryana, northern and western Rajasthan, and Kachchh and Kathiawar regions of Gujarat is below 600mm. It is below 200mm in the drier parts of Rajasthan.

The distribution of annual rainfall in India shows two main trends:

First, it steadily declines from West Bengal and Orissa coast, towards the west and the northwest.

Secondly, it shows a declining trend

from the west coast of India towards the interior of the peninsula.

Variability of Rainfall

A characteristic feature of the monsoon rainfall is its *variability*. The actual rainfall of a place in a year may deviate from the mean by 20 to 50 per cent.

The variability of rainfall may be computed with the help of the following formula:

$$C = \frac{\text{Standard Deviation}}{\text{Mean}} \times 100$$

Where C is coefficient of variation.

The values of coefficient of variation indicate the direction from the mean values of rainfall.

The values of coefficient of variation generally range between 15 and 30 per cent. The coefficient of variation is less than 15 per cent in Mangalore, Sikkim, Arunachal Pradesh, Nagaland, Manipur and Mizoram also fall in this range. The rainfall is highly variable over the interior of the Plateau. Over the interior regions of Maharashtra, Andhra Pradesh and Karnataka coefficients of variation are as high as 30 per cent. Southern Gujarat, Western Madhya Pradesh and central parts of Uttar Pradesh also fall within the same range. The variability of rainfall over Rajasthan and Gujarat is over 40 per cent. The desert areas of Rajasthan and parts of Kachchh and Gujarat may experience still higher variability ranging between 50 and 80 per cent (see Fig. 18).

Variability of rainfall plays a critical role in Indian agriculture. The areas characterised by high variability have a chronic deficiency of water and crop failures are very common. These areas also experience spells of drought frequently.

Incidence of Drought

The generally variable character of

monsoon rainfall is caused by variations in the direction and frequency of tropical depressions and other factors controlling the monsoon regime. This leads to the occurrence of drought in certain parts of the country. The intensity of drought varies from year to year. It is generally more frequent in areas having low rainfall. The driest parts which are liable to drought lie in Rajasthan, adjoining Haryana and of Gujarat. These are areas of recurrent drought. The drought is less intensive in the belt adjoining this zone; roughly lying to the south-east of a line joining Ahmedabad and Kanpur.

Another area liable to frequent drought lies on the leeward side of the Western Ghats. It is estimated that an area of about one million sq. km. receives inadequate rainfall and is drought-prone. The drought-prone areas deserve special attention as special measures have to be taken to protect agriculture from the vagaries of monsoon.

Climatic Regions of India

Broadly speaking India has a Monsoon Type of climate. The combination of the elements of weather, however, reveal many regional variations. These variations represent the sub-types of the monsoon climate. It is on this basis that the climatic regions can be identified. A climatic region is homogeneous in climatic conditions which are caused by the combined effect of factors (see Fig. 19). The classification of climates is a complex exercise in itself. The observed values of various elements of climate, such as temperature and rainfall have to be grouped together, adopting some statistical procedure and an index is derived. Generally the two most important climatic factors are temperature and rainfall. They are considered as most crucial in all schemes of climatic classification.

In the following section we will identify the climatic regions of India as based on the schemes developed by Koeppen and Thornthwaite.

Regions based on Koeppen's Scheme

Koeppen based his scheme of climatic classification on the monthly values of temperature and precipitation. Using this method of classification five major climatic types can be identified. They are as follows.

- A : Tropical humid climates
- B : Dry climates
- C : Warm climates
- D : Snow climates
- E : Ice climates

Koeppen denoted these types by using letter symbols. These five types were further sub-divided into sub-types on the basis of seasonal variations in the distribution pattern of rainfall and temperature. Koeppen used small letters such as m, w, or h to define these sub-types.

Based on Koeppen's method, India can be divided into the following climatic regions.

- Amw : Monsoon type with short dry season
- As : Monsoon type with dry summers
- Aw : Tropical Savannah type
- Bshw : Semi-arid steppe climate
- Bwhw : Hot desert type
- Cwg : Monsoon type with dry winters
- Dfc : Cold-humid winter type with short summers
- E : Polar type

Koeppen's Amw type of climate prevails over the western coast of India south of Goa. The As type characterised by dry summers, is experienced along the Coromandel coast. The dry climate prevails in two regions of India. The interior parts of the peninsula, Rajasthan and parts of Haryana have Bshw type of climate, while



Fig. 18 India—Variability of Annual Rainfall

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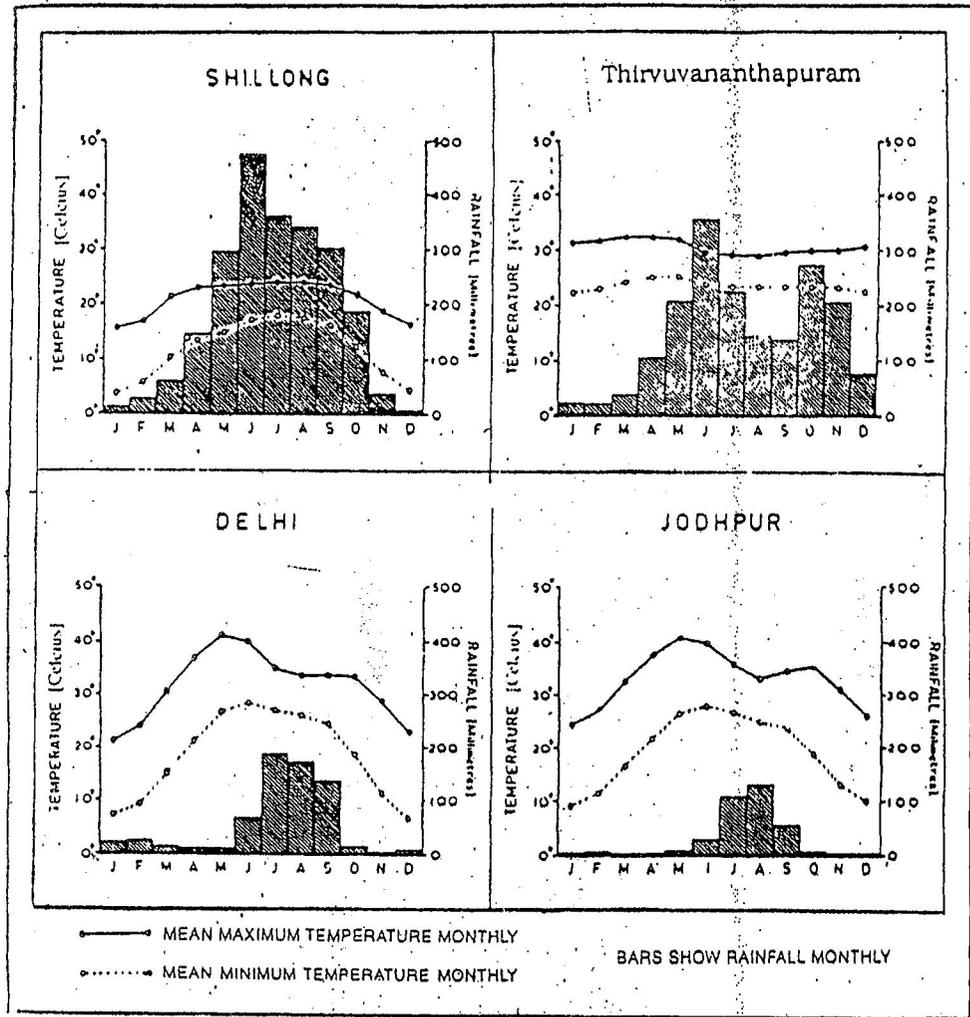


Fig. 19 Temperature and Rainfall of selected places

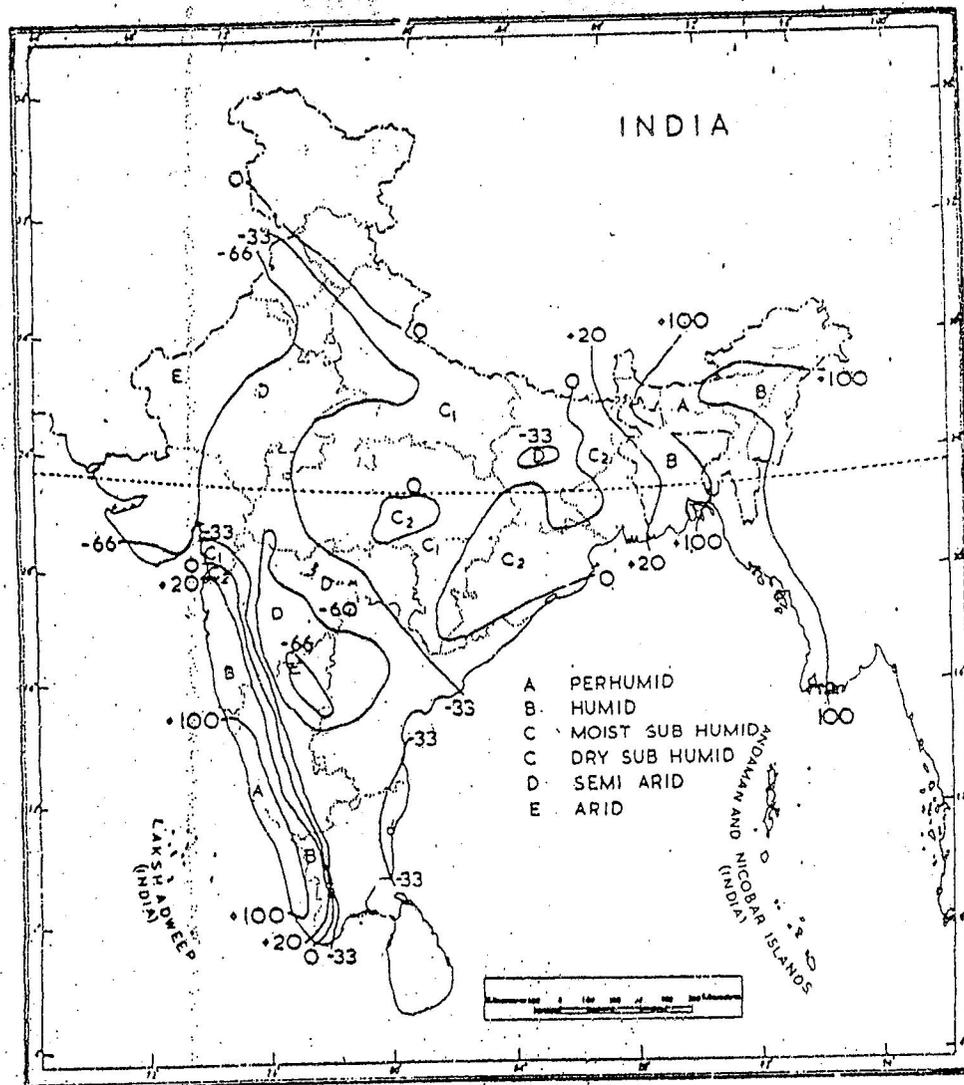


Fig. 20 India—Climatic Classification (Thornthwaite)

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The boundary of the climate shown on this map is interpreted from the Harrogate's Annual (Harrogate) April 1937, but has yet to be verified.

1:100,000 scale of the map is based on the distance of London nautical miles measured from the appropriate base line.

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western Rajasthan is characterised by Bwhw type of climate. Most of the peninsular region has tropical Savannah type of climate (Aw). The North Indian Plain falls under the warm temperate type of climate with dry winters (Cwg). The north-eastern region of India falls under Dfc type of climate. Here the winters are cold and humid, while the summers are short. Kashmir and the adjoining mountain ranges have a polar type of climate (E).

Regions Based on Thornthwaite's Scheme

Thornthwaite based his method of climatic classification on the concept of *water balance*. If the rainfall of a place is less than the amount of water which is lost through evaporation from the surface and transpiration from the natural vegetation, the place has a water deficiency. If it is more than the need, it has a surplus. He evolved a formula to work out monthly values of water surplus and water deficit. Areas having water surplus in all the months of the year have a humid climate and areas having water deficit in all the months of the year have an arid climate. In between these two extremes there are other types with varying degrees of water surplus or water deficit.

On the basis of Thornthwaite's method the following climatic regions can be identified (see Fig. 20).

- A : Perhumid
- B : Humid
- C₂ : Moist sub-humid
- C₁ : Dry sub-humid
- D : Semi-arid
- E : Arid

The perhumid region (A) of Thornthwaite lies along the west coast of

India, south of Goa and in some parts of north-eastern India. The humid climate (B) prevails all along the coast adjoining A, and over the north-west Bengal and the neighbouring parts of north-eastern India. The moist sub-humid (C₂) climate prevails along the Western Ghats. It is also found over Orissa and West Bengal. The Ganga Valley and north-eastern parts of central India have a dry sub-humid type of climate (C₁). The peninsular interior, western Madhya Pradesh, western Uttar Pradesh, Haryana and Punjab have a semi-arid type of climate (D). Saurashtra, Kachchh and Rajasthan on the other hand, experience an arid climate (E).

Thus, it may be noted that the two schemes of classification have interesting differences between themselves; so are the climate regions that we derive from an application of these methods.

The Unifying Role of the Monsoon

The monsoon exercises an all embracing and unifying influence on the weather conditions of India. The seasonal alternations in the wind systems and the associated weather conditions, influx of the maritime air during the summer and the inflow of the western depressions during the winter are all expressions of the monsoon regime. In fact, the monsoon type of climate prevails as much over the desert region of Thar as on the humid West Bengal and Kerala. These are regional facets of meteorological reality, known as the monsoon.

The Himalayas which act as a physical barrier have also imparted a generally tropical touch to the climate even in regions which lie beyond the Tropic of Cancer.

EXERCISES

Review Questions

- Answer the following questions in brief:
 - What does the word 'monsoon' imply?
 - What are the three important factors which influence the mechanism of Indian weather?
 - What is a Jet Stream?
 - How does the westerly Jet Stream help in bringing the western disturbances to the Indian sub-continent during winter?
 - What is the Inter-Tropical Convergence Zone?
 - State three dominant characteristics of the Indian monsoon.
 - How many seasons can be recognised in India? Why do they vary in their length from south to north?
 - What are Western Disturbances? In which part of India do they cause precipitation during winter?
 - What do you understand by the term "Loo"?
 - What is meant by bursting of monsoon?
 - Give three important characteristics of the summer monsoon rainfall.
 - What factors control the distribution of temperature over the Indian sub-continent?
 - Name the rainiest and driest parts of India. Why are they so?
 - Name the coldest and the hottest parts of India and give reasons for such extremities.
 - Why is the coefficient of variation of rainfall low on the west coast of India and high in Kachchh and Gujarat?
 - State the two major factors on which the Koppen's method of classification of climate is based.
 - Name the four months in which India receives the bulk of rainfall. Why is it so?
 - Why does Jammu and Kashmir receive winter rainfall?
 - What is meant by Cwg climate and where is it found in India?
- Give reasons as to why:
 - Mawsynram receives the highest amount of rainfall in the world.
 - The Tamil Nadu coastal region receives most of its rain in winter.
 - The North-western Plains of India experience winter rainfall.
 - South-west monsoons are generally interspersed with spells of dry weather.
 - The rainfall in a year at Jaisalmer rarely exceeds 12 centimetres.
 - Distribution of rainfall in India is not uniform.

- The coastal areas of India do not experience significant variation in temperature between summer and winter months.

- Correlate the relevant parts from the following three Columns and put them in order:

Climatic types	Letter/Symbols	Regions
(a) Monsoon type with dry winters	(Bwhw)	Most part of Peninsular Plateau
(b) Monsoon type with short dry seasons	(Aw)	Kashmir and adjoining mountain ranges
(c) Tropical Savannah type	(Amw)	Western Rajasthan
(d) Hot desert type	(E)	The North Indian Plain
(e) Polar type	(Cwg)	The western coast of India south of Goa

- Notwithstanding the broad climatic unity, the climate of India has many regional variations. Elaborate this statement giving suitable examples.
- Discuss main characteristics of the summer monsoon rainfall and its significance in to the agricultural economy of the country.
- Discuss in brief the mechanism of Indian weather with special reference to Jet Streams.
- Describe the distribution of temperature in India during summer and winter seasons.
- Give an account of distribution of annual rainfall in India. How is it related to the relief of the country?
- 'Monsoons exercise an all embracing and unifying influence on the weather conditions of India.' Elaborate this statement.

Map and Practical Work

- On an outline map of India, show the following:
 - The areas receiving winter rainfall.
 - The summer pressure conditions and the direction of winds.
 - Climatic divisions of India according to Thornthwaite and Koeppen. What differences do you notice after comparing the two maps?
- Draw temperature and rainfall graphs for Thiruvananthapuram, Delhi and Jodhpur on the basis of the following climatic data.

Stations / Places		J	F	M	A	M	J	J	A	S	O	N	D.
Thiruvananthapuram													
Ave. Temp. (°C)	Max.	31.3	31.7	32.4	32.3	31.9	29.5	29.2	29.1	29.7	30.0	30.1	30.7
	(°C) Min.	22.2	22.9	24.2	25.1	25.3	23.7	23.3	23.3	23.3	23.4	23.1	22.4
Ave. Rainfall	(mm)	22.9	20.8	38.6	105.7	207.8	356.4	223.0	145.5	137.9	273.3	20.5	64.7
Delhi													
Ave. Temp. (°C)	Max.	21.1	24.3	30.6	37.1	41.2	40.2	35.1	33.6	33.7	33.3	28.8	23.1
	(°C) Min.	7.3	9.4	14.8	21.4	26.7	28.7	26.9	26.1	24.3	18.5	11.4	6.8
Ave. Rainfall	(mm)	20.8	23.6	12.9	9.7	9.7	67.6	186.2	169.9	134.9	14.2	2.0	8.6
Jodhpur													
Ave. Temp. (°C)	Max.	24.5	27.1	32.7	37.7	40.9	39.8	35.9	33.1	34.5	35.4	31.0	26.2
	(°C) Min.	9.2	11.4	16.5	21.8	26.6	28.1	26.7	25.0	23.8	18.7	13.2	10.2
Ave. Rainfall	(mm)	5.1	6.1	2.8	3.3	9.7	30.7	68.2	31.3	57.4	7.6	1.8	2.00

CHAPTER 4

Soils and Natural Vegetation

Soils and natural vegetation of India reflect a state of perfect harmony with the relief and climatic conditions of the sub-continent. In fact, this correspondence is so perfect that if one superimposes the two maps showing the annual rainfall and the altitude expressed in metres above the mean sea-level (MSL) one can easily infer the types of vegetation that will be found in each major region of the country. Soils also follow the general pattern as determined by climatic conditions and altitude, although geological structure and the surface flow of water modify their characteristics significantly. Moreover, soils and natural vegetation are interdependent, each modifying the other and getting adjusted to the ecosystem to which both of them belong. This view of the ecosystem is important to our understanding of the harmony of the environment and the place of humans within the environment.

Soil

In a country of the size of India with large differences in terrain and climatic conditions, it is but natural to expect a vast variety in the soil cover. These differences in soil types are a consequence of the diversity in the natural environment noted in the earlier chapters. Soil is formed under specific natural conditions and each of the

elements of the natural environment contributes to this complex process, described by the soil scientists as the process of pedogenesis or soil formation.

The variations in the nature of the soil cover are mainly related to the rock formations, surface features of relief, the pattern of slope, climate and natural vegetation. Further, animals and insects are also associated with this process, and above all, man influences the process of soil formation or its degeneration. This affects the fertility in many ways.

These factors do not act on the soil independently or in isolation but in close association with each other, thus leading to a whole network of interrelationship of quite a complex nature. The material for soil formation, termed by the soil scientists as the parent material, is derived from the rocks exposed on the surface. The relief and characteristics of slope along with the work of the various agents of weathering determine conditions for the disintegration of the rock materials. Thus, the original soil characteristics, including their chemical constituents, are borrowed from the rocks below. Soil may be transported by running water, wind or other agents or it may remain in its original position. When it remains in its original position it is called *in situ* and in that state it is further modified by climate, particularly moisture

NATURAL VEGETATION

areas are covered with indigenous or endemic flora, while the Indo-Ganga Plain and the Thar desert contain plant species that have come generally from outside; that is, they are *exotic*. Nearly 40 per cent of the plant species found in India are *exotic*, and they have migrated from the trans-Himalayan areas (China). This natural vegetation is classified as *boreal*. Plants which have come from the adjacent tropical regions are known as *palaeo-tropical*. Those coming from the north African regions, have influenced the vegetation of the arid and semi-arid regions, such as the Thar, as well as a good deal of the western part of the Indian Plain. Those immigrating from Indo-Malaysia have influenced the vegetal cover of the hilly regions of North-eastern India. This process of the immigration of uninvited plant species not only goes on currently, but has actually become more marked with the increase in communication with other lands both by sea and air. Some of the exotic varieties are troublesome weeds. They thrive under conditions of tropical sun with abundant moisture. They rapidly multiply and spread out as there are no 'natural' enemies to curb them in the new habitat. In course of time, their eradication becomes difficult; they invade the land and reduce the area for other uses, prevent the growth of plants which are economically important and become a hazard to public health by helping indirectly the spread of several diseases. We can cite two striking examples: *lantana* (*Lantana camara varauyleata Mold*) and water hyacinth (*Elchhoita crassipes Solms*). Both were brought into India as decorative garden plants; the former has spread out in our forest and pasture lands, and the latter is choking up our rivers, so much so as to earn its nickname 'terror of Bengal' because of its phenomenal growth in that region. It is spreading to almost all

water courses: rivers, tanks and canals, in the rest of the country. A recently introduced plant which has conquered most areas in India is parthenium, a kind of grass known for its ill-effects on human health, mainly causing respiratory and skin diseases.

The foregoing discussion, brief as it is, relates mainly to Indian flora having their own floristic regions, which are, however, different from vegetation regions, because the basis for classification in the two cases is different. Before starting our discussion on vegetation and vegetation types, it is useful to note that much of our present 'natural' vegetal cover is not that natural, except perhaps in the inaccessible parts of the Himalayas and the interior of the Thar desert. A considerable part of it has been replaced or destroyed as a result of human occupancy of the land. Much of the plant cover is in a degraded condition; that is, low in quality and content. What we usually designate as 'natural' vegetation now, refers to a plant community that has been left undisturbed over a long time, so as to allow individual species to adjust themselves to climatic and soil conditions, as far as possible.

Vegetation and Vegetation Types

As we have noted before, vegetation consists of those plant species which live and grow together in mutual association with each other, under the influence of prevailing climatic conditions and soil types. Individual plants may germinate, grow and wither, but the community as a whole presents a well organised appearance as a group, both in its form and in its ecological characteristics, which earns for them the more commonly known distinction between Forests, Grasslands and Scrub.

Climatic factors — mainly sunshine and precipitation — determine which plant

species can flourish in a specific habitat. India has the following major vegetation types :

- (i) Tropical Evergreen Forests
- (ii) Tropical Monsoon Forests
- (iii) Tropical Grasslands and Scrub
- (iv) Temperate Forests
- (v) Grasslands and Scrub
- (vi) Alpine and Tundra species of vegetation

Locally, soils and drainage introduce modifications; thus, we have edaphic types such as the tidal marshes all along the Indian coastal areas or water-logged areas due to inundation; *babul* (*Acacia*) in flood prone areas in Maharashtra and some other parts of India. It will be seen here that in describing vegetation types we are using the words 'forests', 'grasslands' and scrub mainly with reference to the form and appearance of plants. It is equally important to study their life cycles, because each vegetation type has its characteristic life cycle which represents its delicate balance with its environment. In studying vegetation types, therefore, we concern ourselves with dominant species, their appearance, adaptation, their form, their mutual association and stages of growth to reach a climax; (that is their full development as a community beyond which they do not develop, but remain stable). An interesting aspect, from our point of view, is that some plants are gregarious or 'social' in their collective growth; they do not easily allow other species to grow with them, for example, Indian teak (*Tectona grandis*).

Recent works of H.G. Champion, Schweinfurth, Carl Troll and G.S. Puri have materially added to our knowledge of Indian vegetation types. Drawing mainly from their studies, we shall present here an outline of the Indian vegetation types and their geographical distribution (see Fig. 22).

Moist Tropical Evergreen and Semi-evergreen Types

These are found mainly in the rainy tracts of the Sahyadris and the Shillong Plateau. The Wet Evergreens of the Southern Sahyadris (in Kerala and Karnataka), with their high rainfall, closely resemble the Equatorial forests; but real stands of such type are a few and far between, because of their depletion due to tree cutting. These lofty evergreen forests, with a large variety of species, are important for the spice gardens, as they ensure an even stream flow for irrigation and supply copious leaf manure — both the basic needs of spice plants. Mahogany, Jamun (*Jambolina indica*), bamboos and palms are typical; grass is almost absent. The semi-evergreen type is to be found in the less rainier parts of these regions. Shifting cultivation and colonial exploitation of timber, especially during the First and the Second World War have seriously depleted these forests.

Tropical Moist Deciduous

These are the typical monsoon forests, with teak (*Tectona grandis*) as a dominant species. They form the natural vegetation cover nearly all over the country where rainfall is moderate (100-200 cm), but the rich and useful cover extends over the Sahyadris, the north-eastern part of the Peninsula, and along the foothills of the Himalayas in the Siwaliks, the bhabar and the tarai. In the northern areas, Sal (*Shorea robusta*) is an important tree. These forests, on the whole, have gregarious species. The typical landscape consists of tall teak trees, with other trees, bamboos and shrubs growing fairly close together so as to form thickets; there are also open grass patches. Both teak and sal are economically important, and so is the Sandalwood (*Santalum album*) of the Karnataka forests. Shisham (*Dalbergia sissoo*), hurra (*Terminalia chebula*) and

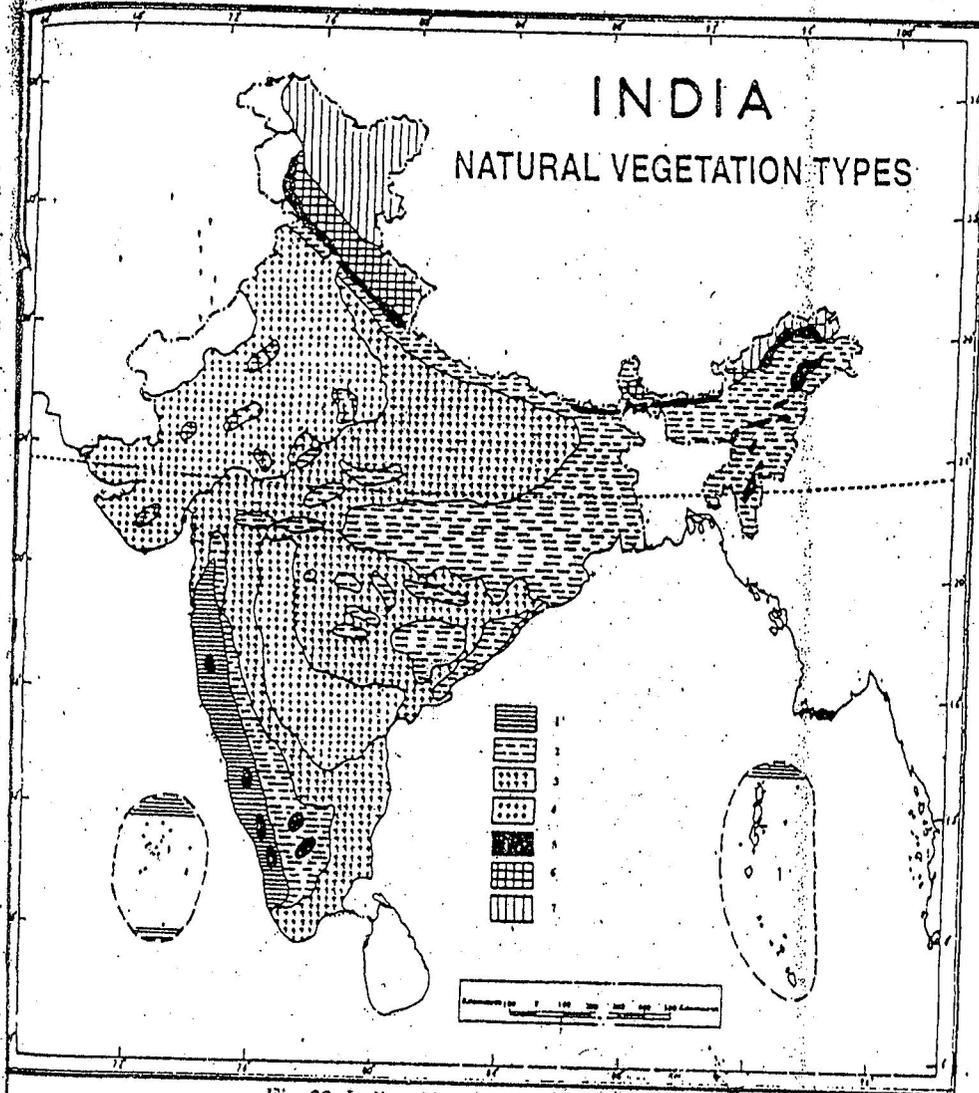


Fig. 22 India—Natural Vegetation Types

(1) Moist Tropical Evergreen Semi-Evergreen; (2) Tropical Deciduous Moist; (3) Tropical Dry Deciduous; (4) Tropical Thurn; (5) Wet Temperate; (6) Dry Temperate with Grasslands; (7) Alps

The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.

Khair (*Acacia catechu*) are commercially important. A much greater attention is now being paid to regenerate these forests through conservation and development.

Dry Tropical Forest : Deciduous and Thorny Type

Much of this type is a degraded deciduous forest. The dry deciduous forest is found over vast areas of the country having 70-100cm of rain. In the rainier parts of the peninsular plateau and the north Indian plain these forests have a parkland-like landscape with open stretches in which teak and other trees commonly grow. These trees are interspersed with patches of grass. With the beginning of the dry season the trees shed their leaves completely and the forest appears like a vast grassland with naked trees all around. During the dry season the farmers burn grasses to destroy the seeds of the common weeds. However, this practice damages the trees as well. The dry deciduous forest changes into a moist deciduous forest in wetter areas. On the other hand, vegetation gives way to a thorn forest in the drier areas. River valleys are generally green. Most of the land is brought under the plough and certain areas are left for grazing. Obviously vegetation has little chance of regeneration.

Human exploitation of land and its resources spread over millennia of years has necessitated the need for regeneration of plant cover. However, it is a difficult problem. Efforts are being made to prevent these lands from degenerating into complete wastelands. In regions with less than 70cm of rain, natural vegetation consists of a thorn forest. Trees include acacias, euphorbias and palms. They are interspersed with patches of coarse grass.

The interior of the peninsular plateau is a vast open grassland. The only tree occasionally growing is a stunted acacia. Cassia and other shrubs are also

commonly found. Summers are long and dry and the entire area looks like a carpet of dry grass, with the rocky outcrops breaking the monotony of the landscape. In the semi-arid areas of Rajasthan and Gujarat vegetation generally consists of dry thorn forests, having mainly cacti and euphorbias.

Forest ecologists have made experiments to show that the forest cover in these dry areas of the interior of the Peninsular Plateau, Rajasthan and Gujarat can be regenerated if human interference can be checked. As we know vegetation is destroyed by human population to satisfy a variety of needs. Livestock population is growing fast and overgrazing has become a common menace. Take for example, the drier areas of Rajasthan where the vegetation is open to attack by humans and beasts alike. A plant is attacked at three levels: at the roots level, rodents nibble the roots; at the lower level goats devour whatever foliage manages to grow; at the higher level the branches are eaten up by the camels. In between come the humans who collect leaves, fruits, seeds and branches for various uses. What remains behind is a stunted tree fighting continuously for survival. And yet it has survived the onslaught of time. This ruthless exploitation of vegetation has to be stopped if we want to save our ecosystem.

It is necessary to emphasise the fact that much of the natural vegetation of the moist and semi-arid deciduous forests has been extensively removed from the North Indian Plain and the interior of the Peninsular Plateau. What one finds today in the Vindhyas, Satpuras, Sahyadris, Eastern Ghats and other mountain ranges are the only remnants of the original monsoon forest. These forests were saved from the human advance because of the hilly nature of the terrain, and its

unsuitability for agricultural pursuits.

Montane (Southern)

In mountainous areas the climate changes at the higher altitudes which leads to the corresponding change in the character of natural vegetation. At the higher elevations in the peninsula, like the Nilgiris, the Anamalais and the Palni Hills, Mahabaleshwar plateau and higher parts of the Western Ghats, the Satpuras and the Malkala ranges and at Mount Abu in the Aravalli Range vegetation is characterised by grasslands (rolling downs) interspersed with stunted rain-forests or the scrub. In this zone mosses and ferns are common. Recently eucalyptus has been planted over many parts of these hilly tracts. The Udagamandalam (Ooty) environs in the Nilgiris offer an interesting commentary on the misuse of forest land. During the Second World War, large areas were brought under cultivation for growing potatoes for the army. This implied felling of trees on a large scale which rendered the landscape almost treeless. It also affected the water supply causing scarcities during the dry summer season which also happens to be the holiday season.

Montane (Northern)

The Himalayan ranges show a succession of vegetation from the tropical to the Alpine types in an interesting altitudinal zonation. At the foothills are found belts of deciduous forests. The wet temperate type is found in a belt to the east of 88°E longitude between a height of 1,000 and 2,000 metres. These forest types occur mainly in the higher ranges of North-eastern India and in West Bengal, Bihar and Uttar Pradesh Himalayas. They occur largely as bands of crested dark green landscape of coniferous varieties, rather open at the base with a cover of matted humus.

Evergreen trees such as oaks and chestnuts predominate and sal occurs at lower levels. At elevations between 1,500m and 1,750m, pine forests are also well developed in this zone, with *chir* (pine) (*Pinus roxburghii*) growing over wide areas. At higher elevations in this zone lie temperate grasslands, as in the Shillong Plateau as well as along the southern face of the Himalayan range in Arunachal Pradesh. Stunted trees like wild olive (*Oliva cuspidata*) occur here interspersed with grasses. Moist temperate forests cover the southern slopes of the Himalayas between 2,000 and 3,000 metres. Broad leaf varieties, like the evergreen oaks, laurels and chestnuts commonly occur. At higher elevations, spine conifers cover vast areas, the more well known varieties being pines, deodars, silver firs and spruce. We are told that the deodar (*Cedrus deodara*) inspired the Sanskrit poet Kalidasa to write his *Meghadootam* and *Kumara Sambhavan*, but less poetically and more materialistically, the deodar now enters the construction industry as a fine durable wood providing timber for railway sleepers. Similarly, the *chinar* and the walnut, which sustain the famous Kashmiri handicrafts, belong to this zone. At many places in this zone, temperate grasslands extend further according to the grain of the land. Higher up there is a transition to Alpine forests and grasslands. Silver firs, junipers, pines, birches and rhododendrons occur in fairly dense forest form, between 3,000 and 4,000 metres. However, they get progressively stunted and gnarled as they approach the snow line. Alpine pastures, with stunted conifers below and snow fields above, occur at an altitude of about 2,250 and 2,750 metres — these covering the higher slopes almost below the permanent snow cover in the Pir Panjal range as well. They are used extensively for grazing by transhumant nomadic tribes like the

Gujjars and the Bakarwals. It may be noted that the southern slopes of the Himalayan range have a thicker vegetation cover because of higher precipitation and sunshine as compared to the drier north-facing slopes.

Use and Misuse of the Vegetal Cover

Today, the position is that only 18 per cent of the total area of India is under forests, and really good forests are much more restricted in extent. On the other hand, the accepted norm for ecological health is that the country should have a forest cover over about one-third of its total geographical area. Clearing of forest over vast areas, practice of shifting cultivation in certain parts of India, heavy soil erosion, over grazing by pastoral groups, extraction of timber for fuel — all consequences of human occupation of the land — are symptoms of the heavy pressure of population on our natural vegetation. Conservation of our forest resources has become difficult against the mounting pressure of human and livestock population. Agriculture has its own demands on land, just as forest produce is needed for a variety of uses which the forests in their present state are simply unable to supply. Nevertheless, attempts

are being made to regenerate the forest and grasslands, and extend their area by improved methods of silviculture and planting fast growing trees to meet the community needs.

State of the Ecosystem

The continuing exploitation of our forest resources has damaged the ecosystem almost beyond repair. As a consequence of the denudation of the hill slopes, soil erosion and recurrent floods have emerged as major problems. It is estimated that on an average India has been losing 1.3 million hectares of forest cover every year. This is an alarming rate indeed. It is now generally realised that forests are life-sustaining agents. They play an important role in maintaining the ecological balance. The recent concern for environment has resulted in rethinking on these issues. As a measure to restore ecological balance social and agro-forestry programmes have been introduced. The main objective of these programmes is to fulfill the basic needs of fuel and fodder. Both poverty and the increasing rate of industrial exploitation of forest resources will continue to be the major challenge before the nation in the coming decades.

EXERCISES

Review Questions

- Answer the following briefly:
 - What is soil? How is it formed?
 - What are the major factors in the formation of soil?
 - What is pedogenesis?
 - What is parent material?
 - How do soil characteristics play an important role in the economic development of a region? Give two Indian examples to explain it.

- What are the characteristics of alluvial soil?
- What is contour ploughing? How can we guard against the danger of soil exhaustion?
- What methods should be used to improve the fertility of the soil?
- What is Khadar?
- What are the major vegetation types of India?
- What do you understand by the term 'Boreal'?
- Why does the exotic flora become a problem for us? Name two such species.
- Which exotic species of plants is known as 'Terror of Bengal'? Why is it called so?
- State two important characteristics of the Moist Tropical Evergreen Forests. Mention areas where they are found.
- What type of vegetation is found in the interior of the Peninsular plateau?

2. Distinguish between

- Flora and Vegetation
- Vegetation and Forest
- Grasses and Scrub

3. Make suitable pairs from the two columns:

A

- Alluvial soils
- Black soils
- Red soils
- Laterite soils

B

- high lands of the plateau
- on the periphery of the plateau
- river basin and coastal plains
- Deccan lava tract

- What is soil erosion? In what different ways does it occur? What methods have been used by man to check soil erosion?
- State the geographical factors influencing the major vegetation types in India and examine the influence of one over the other.
- "Each vegetation has its characteristic life cycle which represents its delicate balance with its environment". Elaborate this statement giving concrete examples.
- "In their altitudinal range, the Himalayas present a succession of vegetation from the tropical to the Alpine". Substantiate this statement.

Map and Practical Work

- On an outline map of India, show the distribution of major soil types.
- On an outline map of India, show the distribution of major vegetation types. Write a brief note on the relationship between the amount of rainfall and the vegetation type, giving at least two examples.

CHAPTER 5

Regions of India

A study of the natural environment and its elements in the foregoing chapters helps in the identification of regions of India based on physical characteristics. Each region has a broad uniformity in its physical characteristics such as relief, geomorphological history, drainage, climate, natural vegetation, animal life and soils. Although at the micro level these regions have striking differences in the elements of the natural environment, there is a broad unity in their general appearance which distinguishes them from the other regional units adjacent to them. The North Indian Plain, for example, has a broad uniformity in relief features and geomorphological characteristics. At the lower level there are striking differences in all these respects. Brahmaputra valley and the Punjab plain are both alluvial plains but sharply differ in details. However, local details have to be ignored in order to identify the unity at the higher level of regional identity. It is obvious that a division of India into natural regions is not a simple exercise. It has to be based on the selection of suitable criteria. The physical history, geomorphological features, climate and soils are not always distributed in a way so as to perfectly correspond with one another. They often overlap. The regional boundaries are, therefore, approximate, not clear cut, and describe only a transitional zone between

the two clearly marked regions.

It is clear that the three-fold physiographic divisions (Northern Mountains, North Indian Plain and the Peninsular Plateau) are distinctly different among themselves. At the meso-level, they are further sub-divided into regions of the second order. These regions within the three macro divisions are based on a number of factors, such as local relief, climate and soils. Although, there is a broad uniformity in the distribution of the elements of natural environment within the macro regions, these variations give rise to lower-level diversities. They are strong enough to be recognised at the lower level.

It may be noted that within the three-fold physiographic divisions of India, regional differences are quite striking. The Assam and Kashmir Himalayas are both part of the northern mountain complex, but they differ in many respects particularly in their glacial features; distribution of moisture, character of natural vegetation and wild life. Similarly, the North Indian Plain has a broad uniformity from Hugli and Tista in the east to the Indus in the west. But even a common observer may notice the important differences in relief and climate, between the Gangetic delta and the Punjab, or the north Bihar plain and the Ganga-Yamuna doab. These differences

are caused by the depositional work of rivers, local climate, natural vegetation and the soil conditions. Even the difference between the plains of west Uttar Pradesh and east Uttar Pradesh are quite well-marked, the climatic regime is not exactly the same in the two regions. It is thus obvious that the criteria in the identification of second order regions (meso-regions) are not necessarily the same as for the first order regions.

Regions of the First Order

Broadly speaking, the following regions of the first order can be recognised:

- A. The Himalayan Mountain Complex
- B. The North Indian Plain
- C. The Peninsular Plateau, and
- D. The Islands

The Himalayas are a macro region with pronounced relief. Their surface features are of recent origin and have been modified greatly by forces of erosion, such as rivers and glaciers. The high degree of slope and the rugged character of terrain do not generally support the development of soil. These highland areas have, therefore, only a shallow cover of soil. The differences in climate and natural vegetation are quite pronounced. They are caused by differences in altitude, soil cover and exposure of the mountain slopes and valleys to the sun and to the winds which bring rain or snow. Both climate and vegetation along with the associated animal life have an interesting pattern of altitudinal zonation. These diversities within the Himalayas have given rise to a mosaic of second order regions, perhaps as complex as the Himalayas themselves.

The North Indian Plain is characterised by generally level relief with minor local variations. However, the climate and the depositional history of rivers seem to be the two main differentiating factors. They, in turn, cause striking differences in soil

and vegetation cover. The work of rivers in itself is controlled by climate and geomorphological characteristics of their source regions.

Being an area which has been exposed to the forces of erosion since the very early stage in its geological history, the Peninsular Plateau has a general uniformity in terms of its relief and physical appearance. There are, however, local variations in the geomorphological features caused by the differential uplift of the Plateau surface, climate and the degree of erosion as well as the soils and natural vegetation. The Plateau has a wide latitudinal extent and consequently a variety of local climates which have given rise to striking variations in the soil and vegetation patterns. It has a higher degree of diversity than the Northern Plain (see Fig. 23).

Regions of the Second Order

The characteristics of the elements of the natural environment in the three macro divisions of India, described above lead us to recognise the following regions of the second order.

A. Regions of the Himalayan Mountain Complex

From west to east the Himalayas consists of a number of distinctly marked regional units. They are:

1. Kashmir
2. Karakoram, Ladakh and Baltistan
3. Himachal and Kumaon
4. Eastern Himalayas
5. Purvanchal Hills

The Kashmir valley, surrounded by high mountain ranges in the Western Himalayas, has a generally distinct regional character. Its temperate climate, temperate and alpine vegetation, level nature of relief and abundant water supply are some of the distinguishing features.

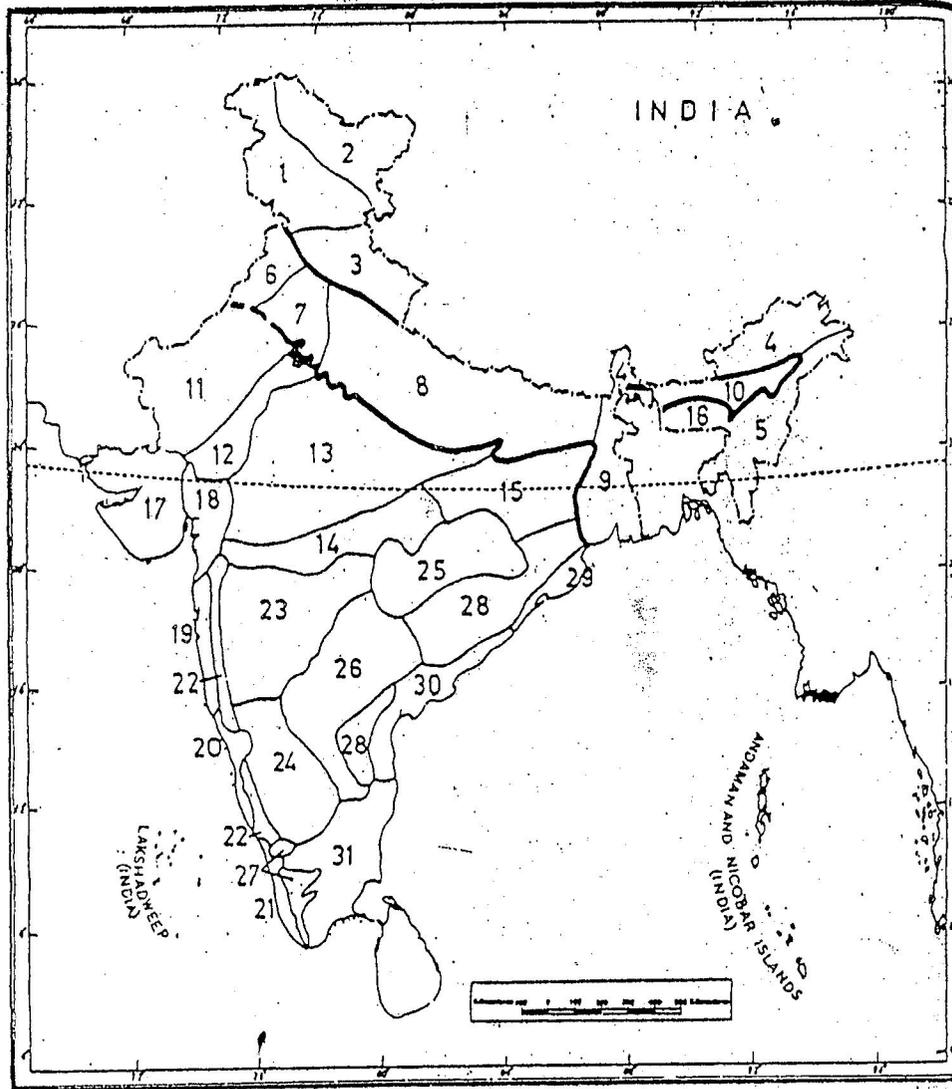


Fig. 23 India—Scheme of Regions

The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.

The surrounding mountain ranges, such as the Pir Panjal and the Great Himalayan Range, have a variety of climates and forest types caused by differences in altitude and exposure to the sun and the rain-bearing winds.

On the north, the Great Himalayan Range gives way to the imposing Karakoram Range and old plateau surfaces such as Baltistan, Aksai Chin, Deosai, etc. Across the Great Himalayan Range and to the north-east of the valley of Kashmir lies Ladakh which has a distinct climate marked by rigorous cold weather. The natural vegetation is also scanty.

To the east of the Satluj gorge the mountain ranges are termed as Himachal Himalayas. Further eastwards they merge into the Kumaon and Uttara Khand regions of Uttar Pradesh. The general relief, however, is not much different. The Himachal Himalayas are different from the Kashmir Himalayas in the rainfall pattern and the types of natural vegetation. Both Kulu and Kangra valleys have a distinct physical appearance of their own. Shimla records 160 cm of rain in a year. The higher rainfall has its effect on the nature of forest types, which are tropical, particularly in the low lying areas. The general setting in Kumaon remains by and large the same.

The Eastern Himalayas are so different from the Western Himalayas that they have to be identified as a separate unit. The change is felt between 86° and 88°E Longitude. To the east of 88°E, the mountains are exposed to the strong monsoon currents from the Bay of Bengal with the result that they receive a far higher amount of rainfall. The luxuriant growth of the Tropical Wet Evergreen forests sharply distinguishes them from the western sector of the Himalayas. These general features continue eastwards into the Assam Himalayas without any noticeable change.

The Indo-Myanmar Hills represent the southward extension of the young-folded mountain ranges (Himalayas). However, they have a low altitude and are less imposing in their relief. They rarely rise above 2,000 metres. The rainfall in this part declines to less than 200cm. The forest cover is thick and changes from the Tropical Evergreen to the Monsoon deciduous types.

B. Regions of the North Indian Plain

The North Indian Plain extends parallel to the axis of the Himalayas from east to west. It is interposed between the mountains and the southern Plateau. It consists of the following main regional units :

6. Punjab Plain (a segment of the Indus Plain)
7. Indo-Gangetic Divide
8. Ganga Plain
9. Delta of the Ganga
10. Assam Valley (Brahmaputra Plain)

Lying in the extreme west, the Punjab Plain is part of the larger plain of the Indus. Only a small segment of the Punjab Plain, however, lies in India. It is characterised by a generally dry climate, showing a clear climatic transition. The Bari (between Beas and Ravi), Bist (between Beas and Sutluj), Rachna (between Ravi and Chenab) and Chaj (between Chenab and Jhelum) are obviously different from the rest of the Plain in their physical characteristics, caused by the shifting river courses. Its arid climate and a dry thorny forest-cover also differentiate it from the sub-humid Ganga Plain towards the east.

The Indo-Gangetic divide is a watershed between the Indus and the Ganga drainage systems. Lying mainly in Haryana between the Yamuna and the Satluj the divide has a generally alluvial character. The outcrops of the Aravali Hills, however, introduce an element of diversity in the south-eastern parts of Haryana. As

In geomorphological character so in climate, the Indo-Gangetic divide shows a change from the Sub-humid Gangetic Valley to the semi-arid Punjab Plain.

The Gangetic Plain is an extensive area of generally uniform relief, consisting of level alluvial plains carved out by the Ganga and its numerous tributaries. However, this uniformity is not so pronounced in climate. The rainfall increases towards the east, bringing with it a corresponding change in natural vegetation as well as soils. This often leads to recognising a further sub-division of the region into the Upper Ganga Plain and the Lower Ganga Plain.

The climate undergoes a further change towards humidity in the Ganga Delta. The deltaic character of the alluvial plain (an intricate maze of river courses and high humidity) is accompanied with high temperatures distinguishing it from the rest of the Plain.

Towards the east, the Plain has another sub-unit in the clearly marked out Brahmaputra valley in Assam. The valley is enclosed by the foothills of the Himalayas, the Purvanchal Hills and the outlying blocks of the Shillong Plateau. The monsoon climate is distinct, although the summer has a shorter duration than in the west. High rainfall and humidity support a thick growth of natural vegetation.

C. Regions of the Peninsular Plateau

The Peninsular Plateau consists of the following second order regions :

11. Thar Desert
12. Aravali Hills
13. Central Vindhyan Uplands
14. Khandesh and Satpura-Malkaj Ranges
15. Chhotanagpur Plateau
16. Meghalaya Plateau
17. Kachchh and Kathiawar

18. Gujarat Plains
19. Konkan Coast
20. Goa and Kannada Coast
21. Kerala Coastal Plain
22. Western Ghats
23. Deccan Lava Plateau
24. Karnataka Plateau
25. Wainganga and Mahanadi Basins
26. Telengana
27. Southern Hills Complex
28. Eastern Ghats
29. Orissa Delta
30. Andhra Coastal Plain and Deltaic tract
31. Tamil Nadu Plateau

The northern flank of the Plateau bordering the Indo-Gangetic Plain consists of a series of table lands separated by troughs of rivers. The Vindhyan Upland to the west of the Aravallis is an arid waste known as the Thar Desert. It is an expanse of sand accumulated during ages of denudation under extremely hot and dry climate. The vegetation cover is very scanty. The Thar extends into neighbouring Pakistan. The Aravali Hills separate the Rajasthan desert from the Vindhyan Upland and the Bundelkhand gneissic country lying to the east. Hill features of the Aravallis are quite pronounced in Udaipur, and their western slope is fairly rainy and forested. North of Ajmer they are generally devoid of forest cover and divide themselves into several parallel ridges separated by longitudinal valleys.

The Central Vindhyan Uplands consisting of the Malwa Plateau and the Bundelkhand gneissic country are divided by a line of scarps and hill ranges, such as the Vindhyan, Bhanvar and the Kaimur Hills. The uplands have been highly dissected and the soil cover, excepting the narrow river basins, is generally shallow. The vegetation varies from the tropical dry deciduous to the tropical thorny types.

To the south of the Narmada rise a

series of scarped plateaus. The relief is dominated by the steep-sided Satpura, Mahadeo and Maikal ranges. The Tapi trough has moderate thickness of alluvium partly contributed by its tributary, the Purna. The historically well known region of Khandesh lies in this alluvial basin interposed between the Ajanta Hills and the Satpura Range.

The Chhotanagpur Plateau east of the Son, is another feature of great interest. It has varying altitude, high rainfall and humidity support a thick growth of the tropical moist, deciduous forest. The Shillong Plateau, an outlier of the Peninsular Plateau in the east, is even more dissected and humid. The agents of erosion have produced a complex maze of hills covered with a variety of Tropical Wet Evergreen forest.

The Peninsular Plateau on the western flank has the outlying lava formations in Kathiawar and Kachchh. The Kathiawar peninsula has a general character of a plateau. It is flanked on the north by the mud and salt wastes of Kachchh. The general elevation of Kathiawar is below 200 metres, but there are several hill ranges, particularly the Gir Range, which rises higher than the general relief. The diversity in rock formation and relief has given rise to interesting variations in soil and natural vegetation. The main features are, however, determined by dry climate supporting only a scanty growth of deciduous vegetation.

The Gujarat plains have a regional identity of their own. The Sabarmati and Mahi as well as Narmada and Tapi rivers have deposited a thick layer of alluvium giving the region a general appearance of an alluvial basin. Climatically, Gujarat plains show a clear transition between the humid west coast and the arid and the semi-arid Rajasthan. As noted earlier the west coast consists of several segments such as Konkan, Goa and Kerala. The

Konkan coast is generally narrow and dominated by the outlying scarps of the Ghats. The Goa and Kanara coast is generally a transition zone between Konkan and Kerala. Climatically it is a hot and humid region with the rainy season lengthening as one approaches the south. The coastal plain widens southwards into Kerala, a region possessing a distinctive character of its own. The Kerala coast shows a great diversity in the distribution of rainfall as well as vegetation. The rainfall, however, shows a decreasing trend towards the southern tip of the peninsula.

The Deccan Lava Plateau is flanked by the Western Ghats on the west. The Ghats, however, continue southwards into Karnataka and beyond as pointed out earlier. They have a general altitude ranging between 900 and 1,100 metres. The Ghats change their physical appearance rather abruptly at a point near Goa.

Here the highly rugged topography of the lava outcrops gives way to the smoothly rounded hills composed of granites and gneisses. The Ghats are a continuous barrier all through, though certain gaps such as the Palghat and Shencottah gaps make cross communication possible. The Ghats are generally forested with the character of vegetation changing from evergreen to the deciduous varieties.

The Deccan Plateau has extensive lava deposits. The lava sheets were laid down in horizontal beds during the last phase of the volcanic activity in the peninsula. These flat table lands are bordered by boldly rising hill ranges such as the Ajanta Hills. The Ghats act as a barrier to the Arabian Sea current of the south-west monsoon with the result that the region presents a typical example of the rain-shadow effect. The soils derived from the weathering of the lava rock formations constitute the well known black soil groups

of India.

The lavas of the Deccan Plateau are replaced by gneisses and granites over the Karnataka Plateau. It is an area of generally uniform relief with elevation ranging between 450 and 800 metres. The general uniformity in relief features is, however, disturbed by variations in local climate, natural vegetation and soils. The two main sub-regions of Malnad and Maidan stand out as clear examples of this diversity.

To its east and the north-east, Deccan Lava Plateau is replaced by a series of undulating plains and low-lying basins. These include the Wainganga valley and the Mahanadi basin in Chattisgarh. Striking differences are observed both in the distribution of rainfall and forest types between these two sub-regions. The rainfall in the Wainganga valley is generally less than 135cm. In the upper Mahanadi basin it is generally higher than this value. The sal forest of the Wainganga valley gives way to the teak forest in the Mahanadi basin.

To the south-east of the Deccan Lava country lies Telengana. It is a low plateau highly denuded and dissected. The isolated rock features called *monadnocks*, produce some diversity in the otherwise open and mature topography. Only the northern parts have scanty vegetation. The south is mainly an expanse of tropical grasses of the Savannah type.

The Palghat gap in the Western Ghats gives way on the south to the most complex mountain ranges of the Peninsula. Thus, Southern Hills Complex includes the Nilgiris, Anamalais and the Palani Cardamom group. They have a typical horst topography. Besides being a region of rugged relief, these hills are further distinguished on the basis of a rich growth of forest, particularly consisting of trees like the teak and the sandalwood.

The peninsular interior is bordered on

the east by a discontinuous line of hills called the Eastern Ghats. They have, however, no comparison with the Western Ghats. The hills consist of three main groups — (i) the northern hills which lie between Jamshedpur and the Godavari, (ii) the hills lying between the Godavari and the Palkonda range and formed mostly of the rocks of the Cudappah system, and (iii) Tamil Nadu Hills lying between the Palar and Kaveri. The general aspect of these hills is determined by rainfall (which is not uniformly distributed) as well as natural vegetation. These differences are mainly caused by a location parallel to the eastern coast and the north-south trend in rainfall distribution. The northern hills are more forested than the southern. The Cudappah hill ranges are generally wooded but not as thick as the northern hills. The Tamil Nadu Hills, on the other hand, have some forest growth on the eastern slopes.

The east coast of India has three main segments — Orissa Coast, Andhra Coast and Coromandel Coast of Tamil Nadu. In Orissa, the Mahanadi and Brahmani have built a wide deltaic plain, generally moist and forested in parts. The Andhra Coastal plain and the deltas of Godavari and Krishna show the transition between the south-west and the north-east monsoon regimes. This transition is clearly seen in the Godavari delta. The Coromandel coast has its own rainfall regime determined by the north-east monsoon. Obviously the entire eastern coastal plain and the deltas of Krishna, Godavari and Kaveri are an area of population agglomeration based on intensive agriculture.

D. The Islands

The Islands consist of two major groups
32. Lakshadweep group
33. The Andaman and Nicobar group

The former lies in the Arabian Sea off the Kerala coast and the latter in the Bay

of Bengal. There are significant differences between the two groups of islands in structure, relief, population composition and ethnic features. Lakshadweep group consists of thirty small islands, only ten of them are populated. They are coral islands and enjoy a humid, tropical climate. Their scenic beauty attracts tourists from all over the country. Geographically proximity to Kerala has exercised an abiding influence on the culture and the language of the people as most of them have Malayali antecedents. They are by and large Muslim and the entire population is listed as Scheduled Tribes. The capital of the Union Territory of Lakshadweep is situated at Kavaratti.

The Andaman and Nicobar Islands, on the other hand, extend southwards as an archipelago off the cape Negaries in Myanmar. The group extends up to the Indonesian Island of Sumatra. There are two sub-groups — Andamans and

Nicobars. The former consists of North Andamans, Middle Andamans and South Andamans. The latter consists of Car Nicobar, Little Nicobar and Great Nicobar. The islands are thickly forested and besides others support a small population of tribal groups such as the Onges, Andamanese and the Nicobarese. Over time, the tribes have been outnumbered by non-tribes who have migrated from the mainland. The British established a Cellular jail at Port Blair where freedom fighters were imprisoned.

Many of the former prisoners stayed on with their families after independence. The tropical climate bordering on Equatorial conditions, supports a dense growth of natural vegetation and wild life which adds to the scenic beauty of the islands. The Nicobar tribes have affinity to the Nicobarese, a branch of Mon-Khmer, itself a sub-family of the Austro-Asiatic languages. The capital of the Andaman and Nicobar Islands is situated at Port Blair.

EXERCISES

Review Questions

1. Answer the following briefly :

- (i) How will you define a natural region?
- (ii) What are the various natural characteristics which are generally taken into consideration while dividing a region into different sub-regions?
- (iii) What do you understand by the term 'regions of the first order'? Name the macro (first order) regions of India.
- (iv) How does a meso region differ from another within a single 'Macro' unit?
- (v) Name the five distinct regional units of the Himalaya in India. State three important differences between the Eastern Himalaya and the Western Himalaya.
- (vi) How is the Himachal Himalaya different from Kashmir Himalaya?
- (vii) What is a water divide? Where does the Indo-Gangetic divide lie?
- (viii) State the important geomorphological and climatic characteristics of the Ganga Plain.

- (ix) Name the main segments of West Coast of India, south of the Narmada.
 - (x) State three main differences between the West Coast and the East Coast of India.
 - (xi) What are the characteristics of the Gujarat Plain?
 - (xii) State the important natural characteristics of the Telengana region.
2. Distinguish between :
 - (i) First order and Second order regions of India
 - (ii) Horst and Rift valley
 3. "The regional boundaries are approximate and not clear-cut." Explain.
 4. The three-fold physiographic divisions of India provide framework of regions at the micro-level. Elaborate.
- Map and Practical Work**
5. On an outline map of India, mark the boundaries of the first order regions. Also, mark second order regions of the North Indian Plain.

CHAPTER 6

The Peopling of India

THE PRESENT DAY population of India is an outcome of a very long process of peopling of the sub-continent. Human groups with different ethnic (racial) backgrounds have entered the south Asian sub-continent at different points of time. Their emergence in India and their settlement and later movements within the country resulted in a high degree of intermingling between the various ethnic groups. The ethnic and cultural diversities displayed by the population today have thus acquired their distinguishing traits through this process of intermixing.

The locational characteristics of the sub-continent noted in the first chapter, and the land and the sea contacts with the neighbouring regions should help us in appreciating the nature of these ethnic links. The partially enclosed character of the Indian sub-continent has already been noted. The Himalayas have acted as a formidable barrier in the past cutting it off from the rest of Asia on the north, north-west and the north-east. In the south a vast expanse of the sea has promoted a certain degree of isolation. These physical factors of location, accessibility by land and sea and the routes of migration into India have played a key role in defining the nature of its ethnic links in the past.

Anthropologists tell us that the emergence of the (early man) Homo

Sapiens did not take place within the sub-continent. The racial groups found in India today are believed to have come from outside at different points of time. These in-migrating streams of people coming from different centres of human dispersal have found the numerous passes in the Himalayas as the most favoured entry points. Their later movements within the sub-continent have taken place along the river-valley routes leading to a continual process of redistribution of population and ethnic intermixing at every stage. The differences in the physical features and the natural vegetation found in different regions of India have already been noted. Obviously, the river basins have been the main areas of attraction as they have been penetrated and colonised again and again. The racial groups ousted from these basins, after each incursion, have moved into the relatively less accessible tracts. The hilly and the forested tracts, on the other hand, have been most unattractive areas from the point of view of settled agriculture, and the human groups inhabiting them have remained comparatively undisturbed. They have also in some cases, served as refuge areas for the ethnic groups ousted from the river basins and the comparatively open areas of the country. It is in these otherwise isolated regions that the earliest racial

groups have survived till today. These enclaves have nurtured the most primitive forms of culture and have generally discouraged cultural change as the contacts with the outside world have always been limited.

Early Streams of In-Migration

The anthropologists believe that the Early Man entered India about 4 to 5 lakh years ago. This is inferred from the evidence of the Palaeolithic (old stone age) tools. These Palaeolithic tool-making groups most probably, moved into the country from the passes in the Western Himalayas and moved far and wide within the country along the favourable river-valley routes. The location of the sites bearing the Palaeolithic tools, in the terraces and basins of rivers, such as, the Sohan, Chambal, Son, Narmada, Sabarmati, Pennar, Godavari, Krishna show that the early man preferred the river basins for the exploitation of their rich resources, particularly, food resources. It is interesting to note that the main centres of population today like the Ganga valley and the deltaic tract of the Ganga are by and large devoid of any evidence of the existence of the early man. This may be due to the unfavourable conditions prevailing in these areas during the Pleistocene time (the period of the early tool-making groups). The science of archaeology has developed methods of dating the tools such as hand axes, choppers and cleavers. The archaeological findings throw some light on the pattern of early streams of in-migration in the Indian sub-continent. Another set of useful evidence is found in the pottery remains (potsherds) dug out from the different sites in the country suggesting the rise of neolithic (New Stone Age) societies who were making a transition towards the eventual rise of agriculture. The structure

of languages and dialects spoken by different ethnic groups in various parts of the country also throws some light on the antecedents of our people.

Distribution of Racial Groups

It may be pointed out that the term race is used in this discussion in a biological sense. Racial differences are based on physical attributes of the human population. They have nothing to do with their inner qualities of head and heart. Thus, race cannot be the basis of discrimination. In fact, biology teaches us about the basic unity of the human kind irrespective of colour or race.

Broadly speaking the present day population of the Indian sub-continent is supposed to have affinity to the following racial groups :

1. The Negritos
2. The Proto-Australoids
3. The Mongoloids:
 - (i) Palaeo-Mongoloids
 - (a) long-headed type
 - (b) broad-headed type
 - (ii) Tibeto-Mongoloids
4. The Mediterraneans :
 - (i) Palaeo-Mediterraneans
 - (ii) Mediterraneans
 - (iii) The so-called Oriental stock of the Mediterraneans
5. The Western broad-headed (Brachycephalic) groups consisting of the
 - (i) Alpinoids
 - (ii) Dinarics
 - (iii) Armenoids
6. The Nordics

These racial divisions are identified on the basis of the superficial physical and biological traits, such as the colour of skin, stature and build of the body, form of the head and the face, the formation of nose, lips and the forehead, and the colour and form of eyes and hair. Intrinsically all men are identical and endowed with equal

mental and physical potentialities. The physical differences distinguishing racial stocks from one another owe their origin to variations in environmental conditions in which early evolution took place. They have nothing to do with the qualities of an individual.

The *Negritos*, a short-statured type of the Negroid race, are characterised by woolly hair, bulbous forehead, broad flat nose and slightly protruding jaws. They were probably the first to arrive in India. However, later incursions of the Proto-Australoids completely wiped out the evidence of their presence in any region of India. Anthropologists believe that some of the tribal groups of India such as *Kadars* and the *Puliyans*, living in the hills of the peninsula and in the Andaman Islands reveal some affinity with the Negrito stock.

The *Proto-Australoids* probably came soon after the negritos. They constitute the bulk of the population in many parts of the interior of the peninsula. Physically they differ from the negritos in many respects. For example, they do not have woolly hair. Those having affinity to the Proto-Australoids live mostly in the hilly and the forested tracts of central and southern India, as well as certain parts of northern India.

The time of arrival of the Proto-Australoids in India is debatable, although it is certain that they came at quite an early date. They, along with the Mediterraneans, are believed to be the builders of the Indus Valley Civilization as their skeletal remains have been discovered from the burial grounds at the Indus Valley sites of Mohanjodaro and Harappa.

The *Mongoloid* racial stock is mainly concentrated in the Himalayan borderland, particularly in Ladakh, Sikkim, Arunachal Pradesh and other parts of north-eastern India. Their original homeland was China

from where they were pushed southward into the Malay peninsula and Indonesia. Their incursions into India became possible through the passes in the northern and eastern mountain ranges.

The Mongoloid racial stock in India may be divided into two types. The Palaeo-Mongoloids and the Tibeto-Mongoloids. The Palaeo-Mongoloids which constitute an earlier branch are further differentiated between broad-headed and long-headed sub-types. They live mostly along the fringes of the Himalayas, being especially numerous among the tribal population of Assam and the bordering state. The Tibeto-Mongoloids supposed to have come from Tibet, are mostly living in Bhutan and Sikkim, as well as in the north-western Himalayan and trans-Himalayan regions including Ladakh and Baltistan.

It is thus obvious that the tribal population of India displays a high degree of ethnic diversity. They seem to have great affinity with the racial stocks described above, particularly the Proto-Australoids and the Mongoloids.

The *Mediterranean* racial stock found in India has been drawn from south-west Asia. It is from this region that during the third and the second millennium B.C. (3000-1000 years before Christ) the Mediterranean stock gradually spilled over the surrounding areas. Those who entered India belonged to different, though related, types of the Mediterranean stock. They may be grouped into three distinct groups — Palaeo-Mediterranean, Mediterranean and the so-called Oriental type. They are all long-headed, and they came to India with a fairly high level of culture. The first and the most ancient group among the Mediterranean stock entering India have been termed as the Palaeo-Mediterraneans. They were medium statured, dark-skinned, slightly built and long-headed people. It seems

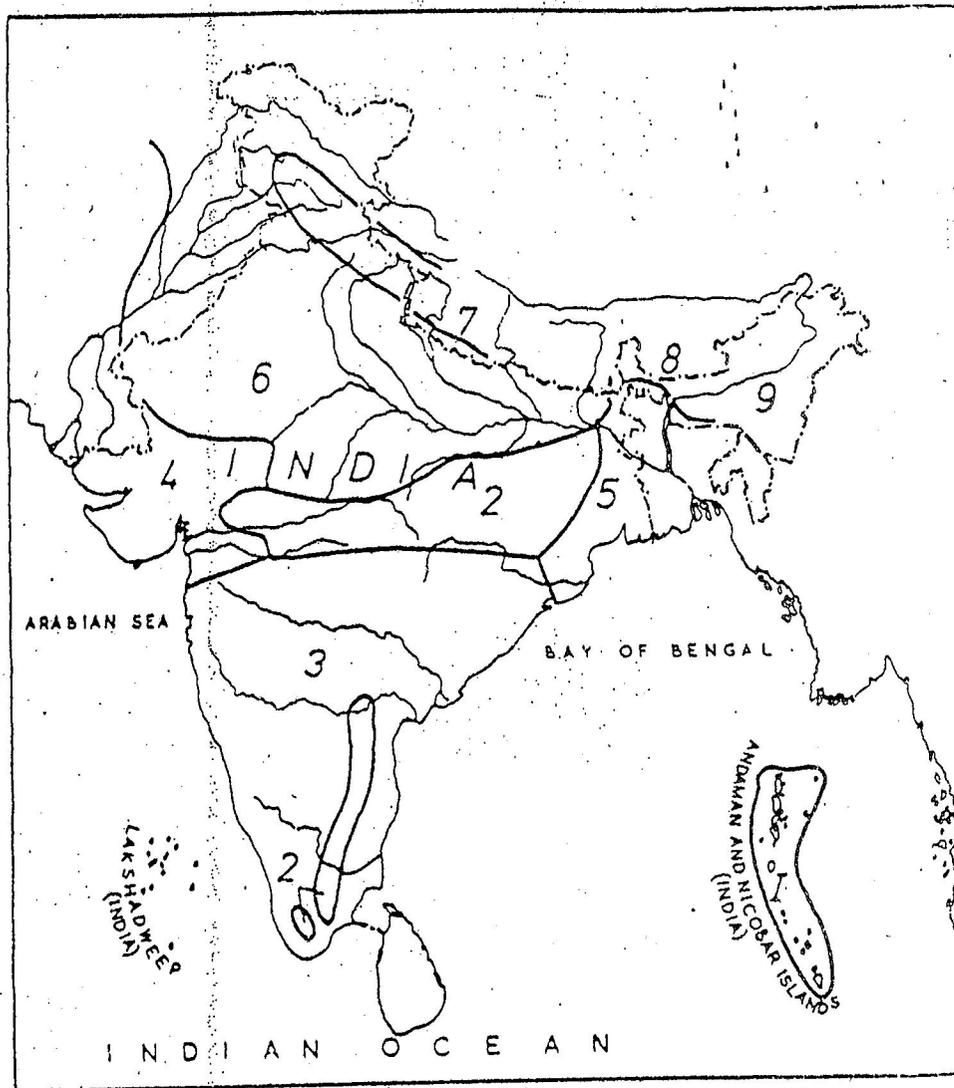


Fig. 24 India—Distribution of Racial Groups

(1) Negritos; (2) Proto-Australoids and Negritos; (3) Palaeo-Mediterranean, Proto-Australoids and Alpo-Dinarics; (4) Alpo-Dinarics, Orientos and Mediterraneans; (5) Paleo-Mediterranean, Mediterraneans and Alpo-Dinarics; (6) Mediterraneans, Orientos and Proto-Nordics; (7) Orientos and Tibeto-Mongoloids; (8) Tibeto-Mongoloids and Palaeo-Mongoloids; (9) Palaeo-Mongoloids (Based on B.S. Guha)

THE PEOPLING OF INDIA

probably that these people introduced early agriculture in north-western India. They were, however, dislodged from their early sites in India by subsequent streams of migration and pushed into central and southern India. The Palaeo-Mediterranean stock, together with other sub-types, today forms the bulk of the population of southern India and a considerable portion of the population of northern India.

The Mediterraneans, the mainstream of this racial stock, entered India a little later. They are supposed to be the builders of the Indus Valley Civilization, a task which they accomplished along with the Proto-Australoids, and introduced the first metal or bronze cultures in India roughly between 2500 and 1500 B.C. They were, however, pushed out of their homeland in the Indus Valley by fresh incursions from the north-west and driven to the Ganga plain and perhaps even further south beyond the Vindhyas. Today they constitute the bulk of the population of the lower castes throughout the northern region of India.

The so-called *Oriental sub-type* came much later. They have a much restricted distribution than the other two types mentioned above. They are mainly numerous in the North-Western Frontier Province of Pakistan and in Punjab but are also found in considerable strength in a zone encompassing Sind, Rajasthan and western Uttar Pradesh.

Apart from the Mongoloids, the Indian population contains some other Brachycephalic (or broad-headed) groups. These groups consist of the three main types — Alpinoids, Dinarics and the Armenoids. These types came to India along three main routes passing through (i) Baluchistan, Sind, Kathiawar, Gujarat Plain, Maharashtra, Karnataka and Tamil Nadu; (ii) the Ganga Valley and the delta;

(iii) Chitral, Gilgit, parts of Kashmir and Nepal. Their modern representatives are perhaps found among the Coorgs and the Parsis to name only a few.

The last wave of migration into India brought the Aryan speaking groups known as the Nordics. They are long-headed, fair-complexioned and have well developed noses and strongly built bodies. They entered India some time during the middle of the second millennium B.C. The main concentration of the people having affinity to Nordic stock is in the north-western part of the country. They are a predominant type in the North Western Frontier Province of Pakistan, Punjab, Haryana and Rajasthan. They are mostly represented among the upper castes of Northern and North-western India, particularly in Punjab.

A broad outline of the spatial distribution of the racial groups in India is depicted in Fig. 24. Obviously it presents a generalised picture of the racial components and is only illustrative.

An important fact about the ethnic composition of India's population is that although diversity is quite pronounced, it cannot be over-emphasised. A long drawn process of continuous contact, intermixing and later modifications have created a broad ethnic uniformity. The physical characteristics have merged with each other indistinguishably over time. Despite the tremendous diversity one can conclude that there exists a physical type which is typically Indian. All South Asians whether they belong to Pakistan, India, Bangladesh or Sri Lanka carry this stamp of oneness. On the busy Oxford Street in London it is difficult to distinguish an Indian from a Pakistani, a Bangladeshi or a Sri Lankan. Racial intermingling spread over centuries of shared history seems to have contributed to this over-arching unity.

EXERCISES

Review Questions

1. Answer the following questions briefly.

- (i) Wherefrom the main races of people came to India?
 - (ii) What do you mean by the term 'Homo Sapiens'?
 - (iii) Name two important isolated pockets in India in which the earliest ethnic groups have survived till today.
 - (iv) What do you understand by the term Palaeolithic man?
 - (v) Name the six important racial groups which constitute the present-day population of India. What is the basis of their identification?
 - (vi) Give three important physical characteristics of the Negritos. Name the two tribal groups in our country which are supposed to represent them today.
 - (vii) Which racial group constitutes the bulk of the population in our country?
 - (viii) Where is the Mongoloid racial stock concentrated in our country?
 - (ix) What was the original home of the Mongoloid racial group?
 - (x) Who were the architects of the Indus Valley Civilization?
 - (xi) Who were the Nordics and where did they mainly settle after entering into the Indian sub-continent?
2. Distinguish between:
- (i) Palaeo-Mongoloids and Tibeto-Mongoloids
 - (ii) Palaeo-Mediterraneans and Mediterraneans
3. Why have the river basins been the main areas of attraction for various racial groups?

Map and Practical Work

4. On an outline map of India, mark the areas with major concentration of Negritos and Nordics.
5. Find out the names of the sites where evidence of the Palaeolithic tools has been found in India. Locate these sites on an outline map of India and label them.
6. On an outline map of India, mark the areas inhabited by the Mongoloids.

CHAPTER 7

Population of India : Spatial Distribution and Growth

General Demographic Scene in India

INDIA is one of the most populous countries of the world. We are second only to China in terms of size of population. An overwhelming proportion of our population—about 74 per cent—lives in rural areas. This indicates a massive dependence on agriculture and other related activities. The population is growing at a very fast rate. The average growth rate for the 1981-91 decade has been as high as 21.4 per cent per annum. The cities or towns have registered even a higher growth. This has happened because the urban centres have expanded in area and have encroached upon the surrounding villages, as people continue to pour into urban centres in search of jobs and better living. India's population is by and large male-dominated and the proportion of women has been declining all through the twentieth century. This may be attributed more to the sociological factors which explain the low priority for the female child in the family. In the absence of proper attention the female child falls an easy prey to diseases caused by under-nutrition. A large number of women also die during child-birth. It has been estimated that if the present rate of growth continues, India's population will be doubled in a

period of 36 years. This is likely to happen because despite all efforts birth rates still remain very high (29.5 per thousand in 1990-91). On the other hand, death rates have fallen significantly (9.8 per thousand in 1990-91) on account of expansion of health care facilities and progress in medical science. The prospects for the future appear to be very gloomy indeed. We should look at the present situation in the context of economic opportunities available to the growing population in India. The 1991 Census revealed that majority of population consisted of non-workers.

Workers comprised only one-third of the total population. The workforce mainly consisted of males, the proportion of workers among the male population being 51 per cent. As compared to this the proportion of workers among the female population was only 16.03 per cent. This suggests a very high dependence of non-working population on working population. This explains partly the origin of Indian poverty. A striking feature of India's population is its age-structure. A nation we may be described as juvenile because about one-half of our population is less than 20 years of age. Such a large population of youth has its own social, economic and political implications.

Distribution of Population

With a geographical area of 3.285 million km², India holds seventh rank in terms of area among the countries of the world. In this respect it is surpassed by Australia, Brazil, United States of America, China, Canada and Russia. It is about one-third of the size of Canada, and a little more than one-third of China. However, in terms of population it more than compensates for its low rank on area. India has more people than the population of Russia, the USA, Canada, Australia and Brazil put together.

Census of Population

Population data are mostly collected through censuses in all countries of the world. In the case of India the first census was held in 1872, although the first complete census was taken in 1881 only. Since then censuses have been held regularly with a gap of 10 years. A census of population involves a complicated process of collecting, compiling and publishing complete demographic data pertaining to all persons living in the country at the time of the censuses.

Spatial Distribution

With a population of 846.30 million (including Jammu & Kashmir where 1991 Census was not held and the state's population is projected) in 1991, India was second only to China among the nations of the world. However, the spatial distribution of population within the country is highly uneven (Appendix I). These contrasts are obvious even at the level of the states, and are further sharpened at the level of the districts. Uttar Pradesh has the largest population followed by Bihar, Maharashtra, West Bengal and Andhra Pradesh in the same order (Appendix II). These five states together share among themselves more than one-half of the country's population.

More than one-fourth of our people live in the two states of Uttar Pradesh and Bihar alone. Uttar Pradesh has more people than the two largest states of Madhya Pradesh and Rajasthan. The three southern states of Kerala, Karnataka and Tamil Nadu together have just as many people as Uttar Pradesh alone. In fact, more people live in Delhi than in the state of Jammu and Kashmir or in all the Union Territories put together.

The uneven nature of the distribution of population becomes more evident when we try to find out as to what proportion of India's population lives in each state of the Indian Union. This may be described as the index of concentration. The index of population concentration is 17.04 per cent for Uttar Pradesh, it is 0.15 per cent for Nagaland, 0.22 per cent for Meghalaya and 0.11 per cent for Arunachal Pradesh. The highly crowded state of West Bengal accommodates 8.34 per cent of the country's population, while the share of the agriculturally developed states of Punjab and Haryana is 2.49 and 2.02 per cent, respectively. These are interesting facts indeed.

A closer examination of the census data shows that the states of the Indian Union have an unequal share not only in population but also in area. In fact, it seems that there is little relationship between area and population. While Madhya Pradesh is the largest state and accounts for about 14 per cent of the total area of the country, it accommodates only 8.11 per cent of the country's population. The two larger states of Rajasthan and Andhra Pradesh together have 19 per cent of the country's area but only 13.54 per cent of her population.

Density of Population

The above facts indicate that a ratio of population to an area may be a better

measure of variation in the distribution of population. One such measure is the density of population expressed as number of people per unit area, for example, a square kilometre or a hectare. However, it is a crude measure, and is referred to as arithmetic density. It is crude because the entire area of a country or a state is taken into consideration while calculating the density. In fact, the population lives only in the selected areas which are productive, rich in natural resources and accessible to the humans. The hilly and the rugged terrain, swampy, marshy and forested tracts as well as the areas covered by water bodies are just not suited for human habitation. Since arithmetic density is not a very sensitive index of population crowding, densities are sometimes calculated for the rural population or agricultural population. In calculating the density, cultivated area is considered. A ratio of population to cultivated area is described in France as physiological density. This measure of density gives us an idea as to how many people are dependent on each hectare of cultivated land. It is a highly meaningful index, particularly for countries whose economies are largely dependent on agriculture.

We shall examine here the broad patterns of density of population in the country taking the spatial variations first at the state level and then at the district level. Only arithmetic density has been considered.

With an average density of 267 persons per km² (including Jammu & Kashmir), India is considered to be one of the densely populated countries of the world. An important feature of Indian population is that the density of population has been consistently increasing since 1921. In 1981 the average density was 216 persons per km². At the earlier Censuses of 1951, 1961 and 1971 the respective values were 117,

142 and 177. The population density in 1921 was only 81 persons per km². It is thus obvious that with every successive Census the growth of population results in greater crowdedness. The reason is that while the population increases continuously, area cannot be expanded. The dependence on agriculture continues to be very high. It is natural to happen since the economy is not diversifying. Thus, the high rural densities cannot be reduced since population is not getting diverted to non-agricultural occupations on a significant scale.

State Level Patterns

The national average density of 267 (including Jammu & Kashmir) persons per km² does not give an idea of the nature of unevenness in population distribution in the country. Let us, therefore, examine the spatial patterns in population density keeping the states and union territories in view (see Fig. 25).

Significant variations in population density are observed between the states of India. In view of the adverse environmental conditions densities are low over the hilly states of the North and the North-East. The densities are as low as 57 persons per km² in Sikkim, 73 in Nagaland, 76 in Jammu and Kashmir, 79 in Meghalaya and 82 in Manipur. The average density for Rajasthan, a generally dry state, is 129 persons per km². Densities are generally medium over the states in the mid-Indian region and the peninsular plateau, such as Madhya Pradesh (149 persons per km²) Orissa (203), Gujarat (211), Karnataka (235), Andhra Pradesh (242) and Maharashtra (257).

Densities are high over the coastal state of Tamil Nadu and very high over Kerala. On an average, 429 persons live over one km² in Tamil Nadu. The corresponding figures for Kerala is 749

TABLE 7.1
Density of Population (State-level), 1991

States/Union Territories	Density of Population
INDIA	267
Andhra Pradesh	242
Assam	286
Bihar	407
Goa	316
Gujarat	211
Haryana	372
Himachal Pradesh	93
Jammu & Kashmir	76
Karnataka	235
Kerala	749
Madhya Pradesh	149
Maharashtra	257
Mizoram	33
Nagaland	73
Orissa	203
Punjab	403
Rajasthan	129
Sikkim	57
Tamil Nadu	429
Uttar Pradesh	473
West Bengal	767
Andaman & Nicobar Islands	34
Chandigarh	5632
Dadra & Nagar Haveli	282
Delhi	6352
Daman & Diu	907
Lakshadweep	1616
Pondicherry	1642

persons per km². The densities are also very high over the states of North Indian plain. The densities show an increasing trend while going from Haryana to West Bengal on one hand and towards Punjab on the other. On an average 372 persons live over one km² in Haryana, 473 persons in Uttar Pradesh, 497 persons in Bihar and 767 persons in West Bengal. On the other

hand, the average density for Punjab is 403 persons per km² (Table 7.1)

On the face of it, variations in the density of population appear to have been caused by factors such as relief, climate, water supply, soil fertility and agricultural productivity. However, it will be wrong to suppose that all variations in the density of population are caused by natural and environmental factors alone. The influence of these factors is greater in some regions than in others. For example, relief, altitude and temperature exercise a great influence on the distribution of population in the hilly regions of Jammu and Kashmir, Himachal Pradesh and the North-East. In reality there are social, economic, political and historical factors which have an important role to play in the spatial distribution of population density.

District Level Patterns

A study of the district level density of population reveals that there are striking contrasts from region to region (Fig. 26). These variations are found mainly because of the uneven nature of distribution of natural resources and the fragmented nature of economic development. At the district level, densities vary from 2 persons per km² in Lahul and Spiti to about 23,669 persons per km² in Calcutta. The densities are generally low over the hilly, forested and drier parts of the country, mainly situated in the Himalayan States as well as in the interior parts of Madhya Pradesh, Rajasthan and Orissa. A belt of moderately high densities extends over Maharashtra, plains of Gujarat, Telengana, coastal areas of Andhra Pradesh, parts of Tamil Nadu, Southern Karnataka and the Chhotanagpur region of Bihar.

As noted earlier, densities are generally high over the North Indian plain from Punjab to West Bengal. They are also high over the coastal plains from Orissa

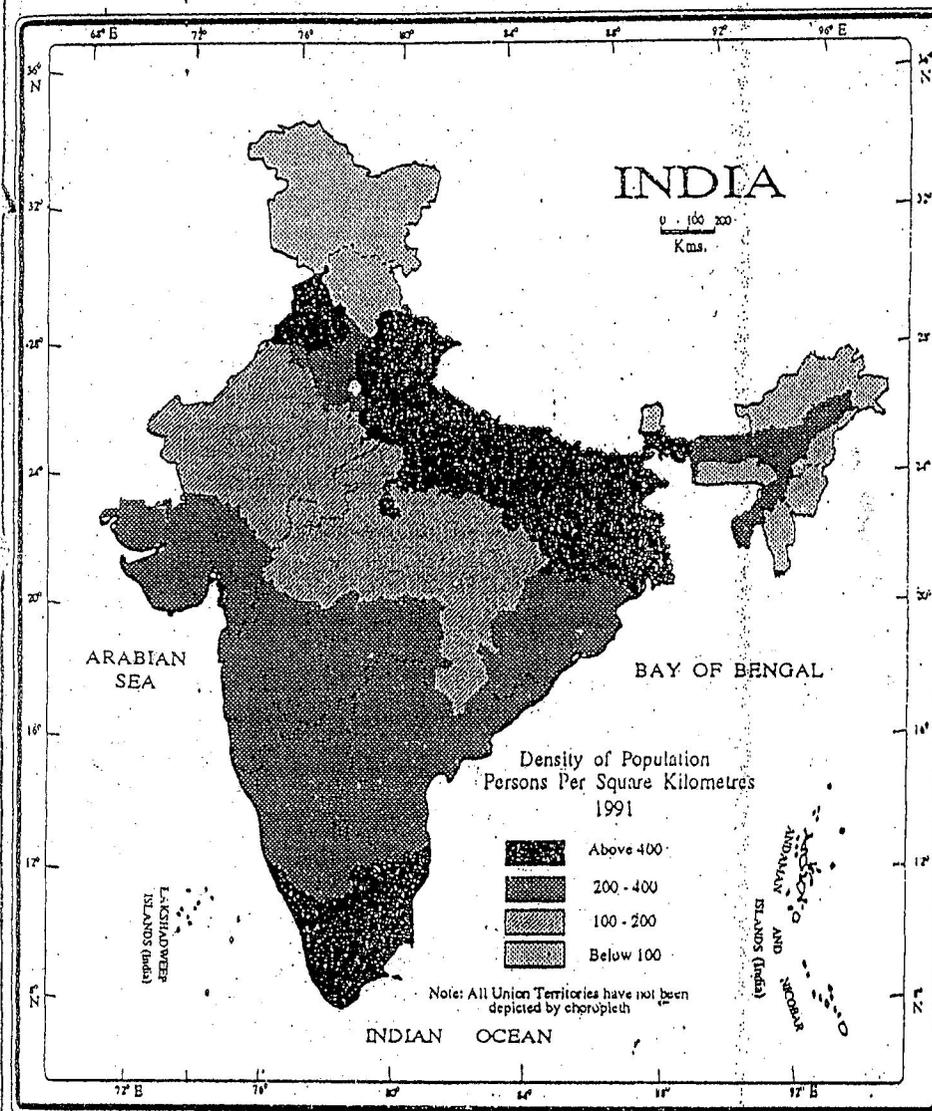


Fig. 25. India-Density of Population (State-wise), 1991

1. Based upon Survey of India map with the permission of the Surveyor General of India
2. The responsibility for the correctness of internal details rests with the publisher.
3. The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.
4. The interstate boundaries between Arunachal Pradesh, Assam and Meghalaya shown on this map as interpreted from the North-eastern Area (Reorganisation) Act, 1971, but have yet to be verified.
5. The external boundary and coastline of India agree with the Record Master Copy certified by Survey of India.

in the east to Konkan in the west.

The districtwise variations in the density of population may be analysed by grouping the districts into the following five categories:

- (i) Very low density
- (ii) Low density
- (iii) Medium density
- (iv) High density
- (v) Very high density

A study of Table 7.2 shows that the number of districts in each state of India belonging to the different categories of density mentioned above varies significantly from state to state.

Areas of Very Low Density

Densities are very low over 32 districts of India. These districts lie in the mountainous regions of the north, north-west and the north-east as well as in the drier parts of Western Rajasthan and Gujarat.

Areas of Low Density

There are 23 districts in which the density of population ranges between 51 and 100 persons per km². These districts are mainly situated in the hilly parts of north-east India and the dry parts of Rajasthan. A number of districts in Nagaland, Meghalaya and Sikkim have generally low density of population. Bastar, a predominantly tribal district of Madhya Pradesh, has also low density of population.

Areas of Medium Density

Densities are generally medium (101-200 persons per km²) over 107 districts. A large chunk of districts in Central India from the Aravali Range in Rajasthan to the Andhra Coast have a medium density. Densities are also medium over the hilly parts of Orissa; Chhotanagpur region of Bihar; Saurashtra and interior

Karnataka.

Areas of High Density

Densities range between 201 and 400 persons per km² over 123 districts. Their geographical distribution shows a highly scattered pattern. However, the areas in which these districts are mainly concentrated include Assam Plain, Tamil Nadu, coastal Orissa and Andhra Pradesh, Maharashtra, plains of Gujarat, Madhya Pradesh, Rajasthan, Uttar Pradesh, and one-half of the districts in Punjab and Haryana.

Areas of Very High Density

The real crowding of population is seen in the remaining 162 districts of India where the density of population is well above 400 persons per km². This group includes districts with a very high rate of urbanization having major urban centres such as Calcutta, Chennai, Mumbai, Delhi, Hyderabad and Chandigarh. We have noted earlier that in Calcutta about 23,669 persons live over a single km². The densities are as high as 21,811 for Chennai, 16,434 for Mumbai, 14,248 for Hyderabad, 6,319 for Delhi and 5,620 for Chandigarh. Naturally, urbanization leads to crowding. Its social consequences are obvious. The cities suffer from chronic problems of housing and supply of minimum social facilities for decent living, particularly for the low income groups.

The density of population is also very high in the districts of North Indian Plain from West Bengal to Punjab. Districts such as Hujli, Haora, North Twentyfour Parganas, Nadia, Murshidabad, Maldah, Vaishali, Muzaffarpur, Sitamarhi, Siwan, Deoria, Gorakhpur, Jaunpur, Ballia support more than 700 persons per km². Densities are equally high over the districts of Kerala. These high densities are largely explained by dependence on agriculture.

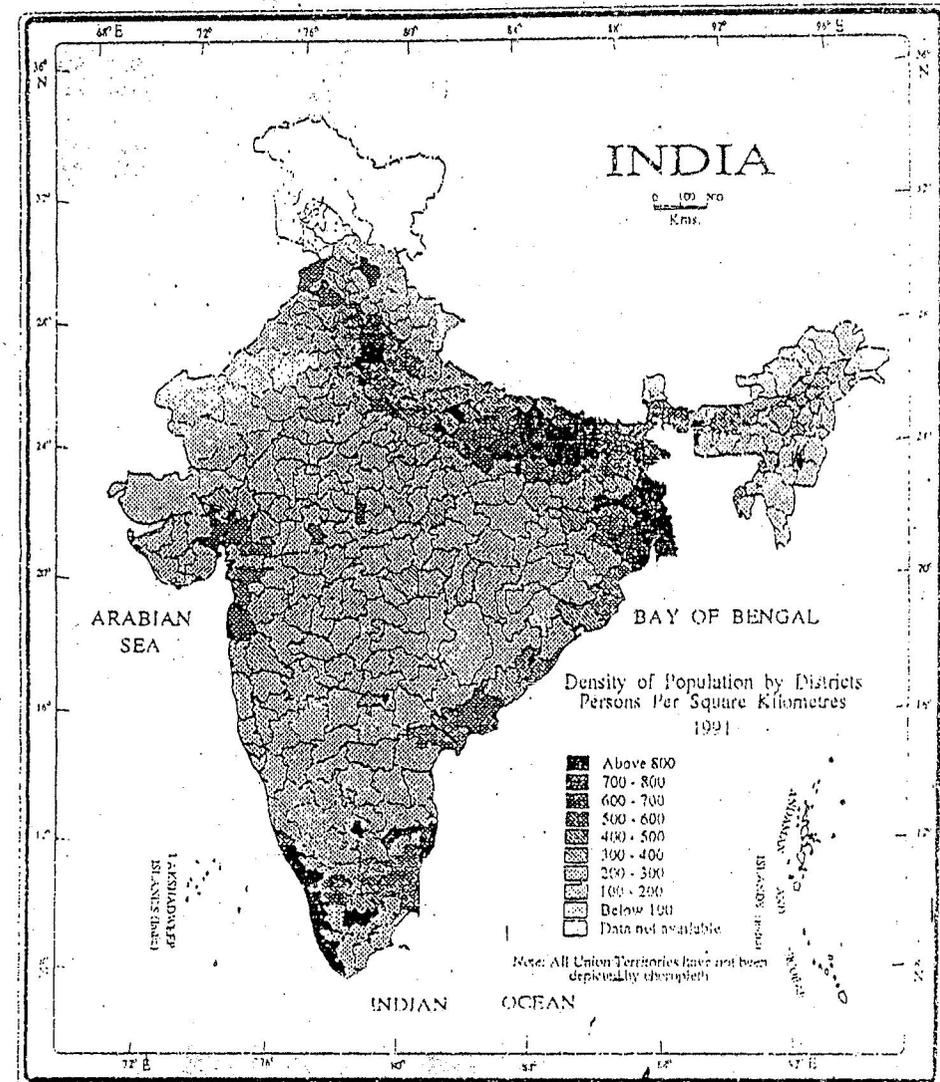


Fig. 26. India - Population Density - District Level Patterns, 1991

1. Based upon Survey of India map with the permission of the Surveyor General of India.
2. The responsibility for the correctness of internal details rests with the publisher.
3. The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.
4. The interstate boundaries between Arunachal Pradesh, Assam and Meghalaya shown on this map as intergraded from the N.E.T. system Area (Reorganisation) Act, 1971, but have yet to be verified.
5. The external boundary and boundary of India agree with the Record/Master Copy certified by Survey of India.

Rural Density

Since an overwhelming population of India lives in villages it will be interesting to examine the variations in the density of rural population for some of the selected districts of India. Rural densities are very high (more than 500 persons per km²) over Malda, Murshidabad and Nadia districts of West Bengal. As many as 14 districts of Bihar plain, 8 districts each of Uttar Pradesh and Kerala also have equally high densities. Notable examples of this pressure of population on land are seen in Alleppey and Thiruvananthapuram districts of Kerala where every square kilometre of rural land supports 900-1,100 persons.

Growth of Population

The human population remains changing all the time. If conditions are favourable, food supplies are adequate and regular and there are no natural calamities, the population tends to increase with the passage of time. On the other hand, if the conditions are adverse, food supplies are short of the requirements and calamities such as droughts, floods and epidemics commonly occur, the population is likely to decline. Moreover, people remain on the move all the time. It is, therefore, obvious that there will be a change in population between two points of time, if there are more births than deaths in a given population; or an addition to the population has been made due to migration. In this situation the population will register an increase. On the other hand, if deaths are in excess of births and there is no net addition through migration the population will decline over time.

Growth in population implies a change between two given points of time. The net change between two points of time is expressed in percentage and is described as the growth rate of population. Growth

may be negative if the population declines over time; it may be positive if there is an increase of population between two points of time. The growth of population is caused by two factors—natural increase (which is an outcome of the excess of births over deaths) and migration. The natural increase may be high but if people migrate out of the territory in large numbers the population will decrease.

Trends in Population Growth

India is one of those countries of the world which have a very high growth rate. In fact, the growth of population during the last several decades has been phenomenally high.

We shall examine here in brief, the demographic history of India during the last 400 years, or so.

It is generally believed that with a rich natural resource base, particularly land resources, India should have supported a sizeable population at different stages in its long history. Several attempts have been made to estimate the population of India before the regular censuses were held from 1872 onwards. According to one estimate India supported 100 million people in 1600 A.D. The population was estimated to be 120 million in 1800, 130 million in 1841 and 255 million in 1871. Since then the population has been increasing consistently. The 1921 Census, however, reported a decline in population due to large number of deaths caused by influenza in 1918. During the period 1921-51 the population of India increased from 250 million to 361.1 million. The 30 year period thus registered a growth rate of 44.4 per cent.

During 1951-81 the population of the country almost doubled. It increased from 361.1 million in 1951 to 683.8 million in 1981. The population further increased to 846.3 million in 1991, with a growth rate

TABLE 7.2
Density of Population (District-Level), 1991
No. of Districts in Each Category of Density of Population

States/Union Territories	Density of population (persons per km ²)				
	Very Low (Below 50)	Low (51-100)	Medium (101-200)	High (201-400)	Very High (above 400)
Andhra Pradesh	0	0	8	11	4
Assam	11	0	0	0	0
Assam*	2	0	2	10	4
Bihar	0	0	4	6	32
Goa	0	0	0	2	0
Gujarat	1	1	5	7	5
Haryana	0	0	0	7	9
Himachal Pradesh	2	2	4	4	0
Jammu & Kashmir**	N.A.	N.A.	N.A.	N.A.	N.A.
Karnataka	0	0	8	11	1
Kerala	0	0	0	2	12
Madhya Pradesh	0	4	33	6	2
Maharashtra	0	1	13	14	2
Manipur	3	1	0	1	3
Meghalaya	1	3	1	0	0
Mizoram	3	0	0	0	0
Nagaland	0	6	0	0	0
Orissa	0	1	8	2	2
Punjab	0	0	0	6	6
Rajasthan	3	2	13	9	0
Sikkim	1	1	2	0	0
Tamil Nadu	0	0	0	12	9
Tripura	0	0	1	2	0
Uttar Pradesh	2	1	5	9	46
West Bengal	0	0	0	1	16
A & N Islands	2	0	0	0	0
Chandigarh	0	0	0	0	1
D & N Haveli	0	0	0	1	0
Delhi	0	0	0	0	1
Daman & Diu	0	0	0	0	2
Lakshadweep	0	0	0	0	1
Pondicherry	0	0	0	0	4
Total	30	21	99	119	158

Note : *Data not available for five districts of Assam; **Census was not held in Jammu & Kashmir.

of 23.85 per cent over the decade 1981-91. The growth rate during the 40 year period since 1951 has thus been as high as 134.36 per cent. At the present rate of growth India's population will double in 36 years. However, the different states and the Union Territories of India will take different

periods of time for getting their population doubled. Thus, while Haryana and Meghalaya will take just 17 years in doubling their population, the population of Goa, Daman and Diu will take 50 years to double. These are estimates only and the unforeseen factors might change this schedule.

TABLE 7.3
Growth of Population 1981-91

States/U.T.	Growth Rate (in per cent)
INDIA	23.85
Andhra Pradesh	24.20
Arunachal Pradesh	36.83
Assam	24.24
Bihar	23.54
Goa	16.08
Gujarat	21.19
Haryana	27.41
Himachal Pradesh	20.79
Jammu & Kashmir	28.92
Karnataka	21.12
Kerala	14.32
Madhya Pradesh	26.84
Maharashtra	25.73
Manipur	29.29
Meghalaya	32.86
Mizoram	30.70
Nagaland	56.08
Orissa	20.06
Punjab	20.81
Rajasthan	28.44
Sikkim	28.47
Tamil Nadu	15.39
Tripura	34.30
Uttar Pradesh	25.48
West Bengal	24.73
Union Territories	
Andaman & Nicobar Islands	48.70
Chandigarh	42.16
Dadra & Nagar Haveli	33.57
Delhi	51.45
Daman & Diu	28.62
Lakshadweep	28.47
Pondicherry	33.64

Regional Variations in Population Growth

The population of India experienced a growth rate of 23.85 per cent during the decade 1981-91. This means that the population has grown by 2.14 per cent per annum. The national average growth rate for the overall population varied significantly from the rural as well as urban components of population. The rural population grew at an average rate of 20.01

per cent. As opposed to this the urban population increased at a fast rate of 36.47 per cent during the same period (see Fig. 27).

The national average growth rates mentioned above do not reveal the regional variations in growth experienced by the different states and the Union Territories (Appendix II). The highest growth rate among the states of India was observed in Nagaland (56.08 per cent). On the other hand, the state of Kerala registered the lowest growth rate (14.32 per cent). It is followed by Tamil Nadu (15.39 per cent). The two states of Tamil Nadu and Kerala along with Goa, Bihar, Gujarat, Himachal Pradesh, Karnataka, Orissa, and Punjab experienced lower growth rates than the All India average.

Among the Union Territories, Delhi recorded the highest growth rate (51.45 per cent). It was followed by Andaman and Nicobar Islands, and Chandigarh. On the other hand, the lowest growth rate was recorded in Lakshadweep (28.47 per cent). It is interesting to note that all the Union Territories experienced a higher rate of population growth than the national average (Table 7.3).

District Level Patterns

The variations in population growth at the district level reveal the dynamics of population change due to the interplay of different forces, migration being one of them. If the national average growth rate is accepted as the bench mark, there are as many as 248 districts which experienced a higher growth rates than the average for the decade 1981-91. The higher growth rates were reported from a large number of districts in Uttar Pradesh, Rajasthan, Gujarat, Madhya Pradesh and Bihar. Two typical cases may be mentioned here. One is that of Yanam district of Pondicherry where growth rate was 74.51

per cent, the highest in India. On the other extreme, Lahul and Spiti district of Himachal Pradesh experienced a negative growth rate of 3.99 per cent. The districts with a higher growth rate do not reveal any pattern in their geographical distribution. They are, however, concentrated in the Gujarat plains, Mumbai-Pune region, Tamil Nadu, Kerala, Coastal Orissa, Central Madhya Pradesh, Chhotanagpur plateau, hilly tracts of Jammu and Kashmir and the North-east. Growth in these areas is supposed to have been contributed more by migration than by natural increase. The thickly populated districts of the country with high concentrations of population reported low growth rates. Obviously they had reached the saturation level.

A striking feature of population change during 1981-91 is that urban areas experienced a very high rate of growth. In this respect the two extreme cases are those of Sidhi district of Madhya Pradesh and South district of Sikkim. The former registered the highest positive growth rate, while the latter reported the highest negative growth. It may be noted that the rate of population growth was not uniformly higher in all the urban areas of the country. The Class I cities experienced a higher growth rate (46.87 per cent), Class II cities experienced comparatively a lower growth rate of 28.14 per cent. The population declined significantly, i.e. by 21.70 per cent in Class VI towns. Class V towns also witnessed a decline in their population but the change was nominal, i.e. 1.27 per cent.

The rural population of India, barring a few exceptions, experienced a low rate of growth, the spatial variations may, however, be explained in the context of inter-state and inter-district migration. The rural population in some districts of Kerala, Tamil Nadu, Bihar, Orissa, Madhya

Pradesh, hilly areas of Uttar Pradesh and Himachal Pradesh experienced low growth rates because of out-migration to urban areas, such as industrial townships and commercial centres as well as to agriculturally developed districts of Punjab, Haryana and western Uttar Pradesh. In some states of South India, such as Tamil Nadu and Kerala, low growth rate of rural population may be attributed to sharp decline in birth rates (number of births per 1000 population).

In certain backward districts of India where the impact of urbanization and industrial development has been only marginally felt, the birth and death rates (number of deaths per 1000 population) continue to be very high.

The history of population growth in India suggests that despite all efforts birth rates have managed to remain very high. On the other hand, death rates have fallen significantly on account of expansion of health care facilities and progress in medical science. With a very large population base and a high rate of natural increase, one may conclude that India's population would continue to grow in leaps and bounds in the decades to come. The pattern of population growth will, however, continue to be fragmented largely because of the fragmented nature of economic development in the country and highly uneven distribution of social amenities.

Migration Trends

The movement of population from one place to another is referred to as migration. Migration may be temporary or permanent. Temporary migrations may be annual, seasonal or even of a shorter duration, such as daily. Daily movements of population between two cities or to a city from its surrounding towns or villages are often described as commutation.

A migrant person is one who at a given

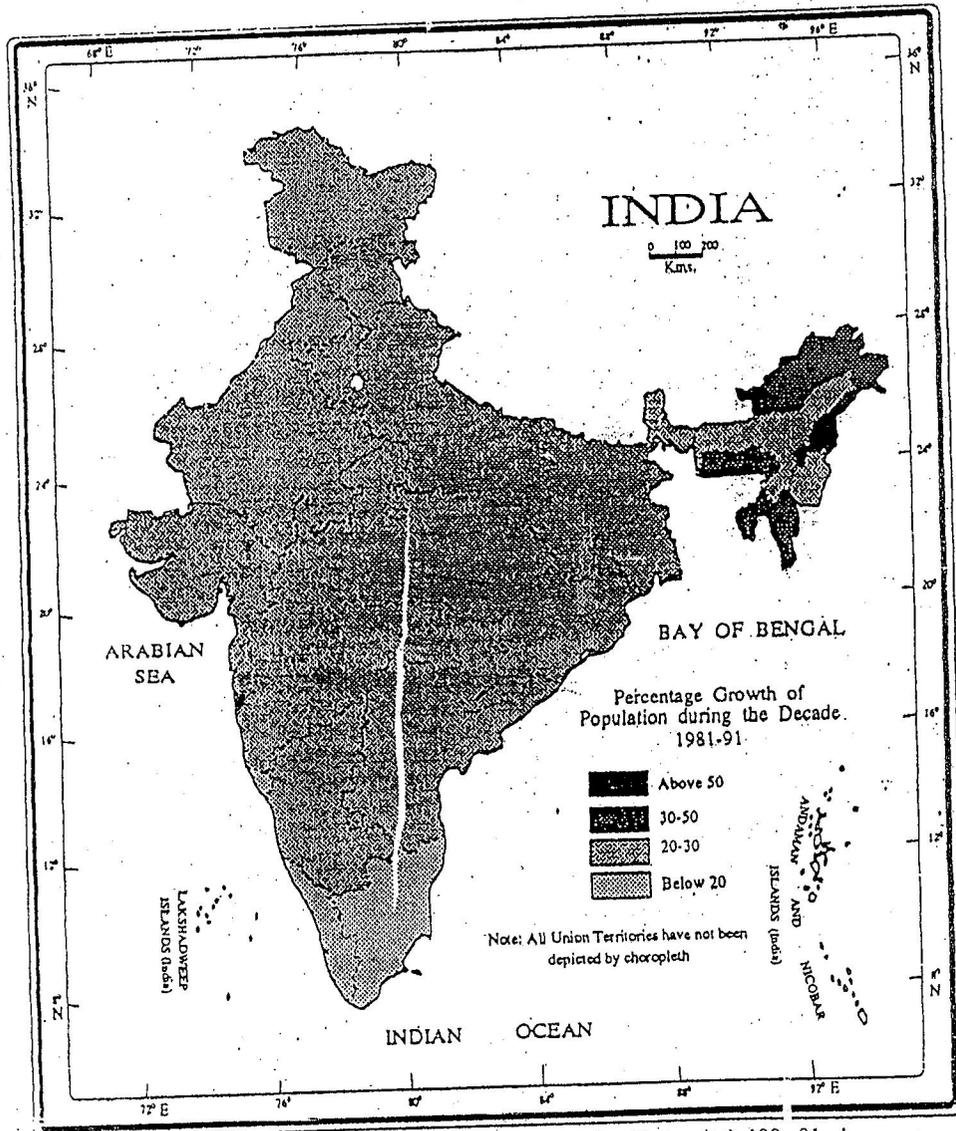


Fig. 27. India-Percentage Growth of Population (State-wise), 1981-91

1. Based upon Survey of India map with the permission of the Surveyor General of India
2. The responsibility for the correctness of internal details rests with the publisher.

census was enumerated at a place other than his/her place of birth. His/her stay at the present place of residence may be of any duration.

The movement of population to and from generates four streams of migration.

- (a) rural-to-rural migration
- (b) rural-to-urban migration
- (c) urban-to-urban migration, and
- (d) urban-to-rural migration

These streams are defined on the basis of source of origin and destination of the migrants. Sometimes people move from a village to a small town and later to a city. Such movements are described as step-wise migration.

Migrations are often caused by a set of factors which may be primarily economic, i.e. search for better economic opportunities, jobs and better living conditions. But non-economic factors, such as marriages, social insecurity, political disturbances and inter-ethnic conflicts also drive people away from their homes. People also migrate on a short-term basis in search of better opportunities for education, recreation, health care facilities, legal services or for availing services which the nearby towns provide.

When migration is caused by the attraction of a city or a town it may be interpreted as a 'pull' factor. But people also migrate due to 'push' factors, such as unemployment, hunger and starvation. When they do not find means of livelihood in their parent village they are 'pushed' out to the nearby, or distant, towns. Millions of people who migrated from far-off villages to the big cities of Calcutta, Mumbai or Delhi did so because in their perception these cities offered them some promise for a better living. Their village homes had virtually rejected them as surplus population which the rural resources of land were not able to sustain any longer.

Migration Trends in India

Trends in the migration of population in India may be studied by grouping the migrant population into two categories—Intra-state, if the movements remain within the same state or inter-state, if the state boundaries are crossed. For example, migrations between Agra (Uttar Pradesh) and the neighbouring district of Bharatpur (Rajasthan) will be described as inter-state although short distances are involved. On the other hand, if someone moves from the Srikakulam district of Andhra Pradesh to Adilabad or Guntur in the same state, the migration will remain intra-state only, although a long distance has been covered.

Intra-State Migration

Bulk of the migrants in India belong to the state of their birth, we may call this migration as intra-state. Another interesting feature is that the people mostly move from one village to another. There were 198 million people who were identified as intra-state migrants at the Census of 1991. Of these, an overwhelming proportion (69.33 per cent) were rural-to-rural migrants. As opposed to this, only 9.10 per cent belonged to the urban-to-urban stream. About 15 per cent of the intra-state migrants moved from rural-to-urban areas, while 5.84 per cent moved in the reverse direction from urban to rural.

Some 75 per cent of the total intra-state migrants were females. This simply shows that bulk of the female migration in India takes place due to marriages. Three-fourths of the female migrants belonged to the rural-to-rural stream of migration. About 7 per cent of female migrants moved from one urban centre to another, 12 per cent moved from rural-to-urban areas and only 5.23 per cent from urban-to-rural areas (see Table 7.4). Of the 48.98 million male migrants about one-

TABLE 7.4
Intra-State Migration Trends, 1991

Migration Stream	Total	Male	Female
R → R	61.34% (137.52)	49.67% (24.33)	75.77% (113.19)
R → U	15.74% (31.21)	27.27% (13.36)	11.95% (17.85)
U → R	5.84% (11.55)	7.68% (3.76)	5.23% (7.82)
U → U	9.10% (18.05)	15.38% (7.54)	7.04% (10.51)
Total Intra-State Migrants	198,369,841	48,985,591	149,384,250
% of Total Intra-State migrants	100.00	24.69%	75.31%

(a) Data derived from the Migration Tables of 1991 Census available on computer diskettes.
(b) R = Rural; U = Urban.
(c) Figures in brackets show absolute number of migrants in millions.

TABLE 7.5
Inter-State Migration Patterns, 1991

Migration Stream	Total	Male	Female
R → R	28.40% (7.52)	18.02% (4.12)	36.71% (5.39)
R → U	32.81% (9.03)	41.42% (4.87)	25.95% (3.81)
U → R	7.17% (1.89)	6.67% (0.78)	7.58% (1.11)
U → U	31.60% (8.36)	33.90% (3.99)	29.75% (4.37)
Total Inter-State Migrants	26,484,521	11,780,504	14,704,017
% of Total Inter-State Migrants	100.00	44.48%	55.52%

(a) Data derived from the Migration Tables of 1991 Census available on computer diskettes.
(b) R = Rural; U = Urban.
(c) Figures in brackets show absolute number of migrants in millions.

half (49.67 per cent) belonged to the rural-to-rural stream, 15.38 per cent were urban-to-urban, 27.27 per cent were rural-to-urban and 7.68 per cent were urban-to-rural.

Inter-State Migration

An interesting feature of internal migration in India is that the volume of inter-state migration is smaller than the intra-state

migration. Thus, there were only 26.48 million migrants in 1991 who crossed the state boundaries. Of these, 28.40 per cent belonged to the rural-to-rural stream, 31.60 per cent were urban-to-urban, 32.83 per cent were rural-to-urban and 7.17 per cent were urban-to-rural.

There were 11.78 millions males among the inter-state migrants. About 18 per cent of them moved between rural areas only. However, the bulk of the migrants (34%) shifted from one urban place to another. On the other hand, about 41 per cent migrated from their villages to urban places. Thus, the urban places, mainly large cities, continued to attract rural masses. Only 7 per cent migrated from urban-to-rural areas, indicating a reverse flow to villages.

There were 14.7 million women among the inter-state migrants according to 1991 Census. Of these 36.71 per cent moved within the rural areas. About 30 per cent moved from one urban place to another. About 26 per cent moved from urban centres to villages.

Conclusions

A number of conclusions may be drawn from the above analysis of migration trends. First, about 85 per cent of all migrants in the intra-state category were born in rural areas. This proportion was 63.1 per cent in the case of inter-state migrants.

Secondly, about three-fourths of all migrants in the intra-state category were women. Since the cause of migration in

their case was marriage, it may be concluded that bulk of migration was not caused by economic factors.

Thirdly, about one-half of the males in the case of intra-state migration moved between the rural places only. It is obvious that they moved out in search of employment on the farms or other establishments within the rural areas. It is understood that a high proportion of such migrants belonged to the relatively less developed states of Uttar Pradesh, Bihar, Orissa, Madhya Pradesh and Rajasthan.

Fourthly, Rajasthan, Uttar Pradesh, Bihar, Andhra Pradesh and Kerala may be identified as the major areas from where out-migration takes place. On the other hand, the states of West Bengal and Maharashtra as well as the Union Territories of Delhi, Chandigarh and Andaman and Nicobar Islands are mostly in-migrating regions. The states of Assam and Madhya Pradesh also belong to this category, although the volume of in-migration to these states is comparatively small.

Fifthly, the main cause of migration appears to be an unequal economic development. Thus, out-migration is likely to take place from areas of high density of population in rural areas which implies increasing pressure on the limited land resources and the consequent poverty. The employment opportunities offered by the big cities, mining and industrial centres, plantation agriculture and green revolution areas appear to be the main attracting factors behind in-migration.

EXERCISES

Review Questions

1. Answer the following questions briefly:

(i) What was the average growth rate of population in India during 1981-91?

- (ii) How long will it take to double the population in India at the present rate of growth?
 - (iii) What factors are responsible for a high rate of population growth in India?
 - (iv) Why is India's population by and large male-dominated?
 - (v) Name the two states which together share one-fourth of the total population of India.
 - (vi) What is meant by the term "Index of Population Concentration"?
 - (vii) Which areas in India have a very low density of population and why?
 - (viii) Name one state each having the highest and the lowest rate of population growth and why?
 - (ix) How many districts in India have a higher growth rate of population than the national average?
 - (x) Name the four streams of migration within a country.
 - (xi) Who is a migrant?
 - (xii) What is the most important factor behind migration?
2. Distinguish between:
- (i) Arithmetic density and Physiological density of population
 - (ii) Migration and Commutation
 - (iii) Intra-state migration and Inter-state migration
3. Write short notes on the following:
- (i) Census of population in India
 - (ii) Rural density of population
 - (iii) Demographic history of India during the last 400 years.
4. "The spatial distribution of population in India is highly uneven". Discuss with the help of suitable examples both from the state and the district level data.
5. Discuss briefly the factors responsible for the variations in the density of population.
6. Describe the main features of population growth during 1981-91.
7. Why do people migrate? Discuss various factors giving Indian examples?

Map and Practical Work

8. On the basis of the data given in the text regarding intra-state and inter-state migration trends, draw separate graphs for the two categories. Compare them and answer the following:
- (i) Among the four streams of migration in 1991, the percentage of urban-to-rural migration both within the state and outside the state is the lowest. Why?
 - (ii) While an overwhelming proportion of intra-state migration is in the rural-to-rural stream only, the three streams in the inter-state category, i.e., rural-to-rural, rural-to-urban and urban-to-urban almost equally share 93% of the total migration. Why?

CHAPTER 8

Population Composition : Demographic Attributes

IN THIS CHAPTER, we shall examine the different aspects of the composition of population. A population is comprised by males and females; who are of different age groups. Their habitat units are different. They may be residing in villages, small and medium towns or large cities. They differ among themselves in terms of activities which are necessary for their survival. A substantive proportion of population may consist of non-workers who are either too young to work or do not work because they are ill or too old to accept any work. These characteristics of population composition may be described as demographic attributes.

Population also varies in terms of its ethnic, social and cultural attributes. For example, the population of India includes different tribal groups whose ethnic identity is distinctly different from the rest of population. The non-tribal society in India is socially stratified and consists of various caste groups with a definite ranking in social hierarchy. The people of India speak a variety of languages and dialects. They also adhere to different religious faiths and belief systems. These characteristics of population composition, described as ethnic and socio-cultural attributes, will be discussed in the next

chapter. Here, we shall analyse the salient characteristics of population based on demographic indicators.

Rural-Urban Composition

The population of India is distributed both in rural and urban areas. The rural habitat has its own distinctive influence on the population as compared to the urban habitat. It is commonly known that the rural folk differ from the urban folk in their occupations, way of life, attitudes and the world view. Urban population, on the other hand, is attuned to urban way of life where the pace of life is fast and social relations are formal. City life also throws up its own problems such as scarcity of housing and health facilities, access to social amenities and transportation. Crowding in the cities leads to social conflicts, besides affecting adversely the urban environment.

We have noted earlier that an overwhelmingly large proportion of India's population lives in villages. A village is a revenue unit. However, the habitat unit in rural areas is a *settlement* which may consist of tiny hamlets with a population of 30 or 50 persons, or even less. Then there may be medium and large-sized villages inhabited by several hundred to several thousand people. A common

feature of population in rural areas is its dependence on agriculture and allied activities such as animal husbandry, collection from the forest and cottage industries. India's population is mostly rural as 73.87 per cent of the total population lives in big or small villages.

Obviously the percentage of urban population is low 26.13 per cent. However, the absolute size of urban population is massive. The 1991 Census enumerated 217.61 million persons residing in urban areas. The urban population of India is more than that of the United States of America which is 187.05 million.

The national average of the proportion of rural population presents only the overall picture. Some states of the Indian Union are mostly rural. In Himachal Pradesh, for example, about 91 per cent of the population lives in villages. Sikkim with 90.90 per cent, Assam with 88.90 per cent, Arunachal Pradesh with 87.20 per cent, Tripura with 84.70 per cent, Orissa with 86.62 per cent and Bihar with 86.86 per cent present almost the same pattern. The degree of urbanization in these states is among the lowest in India (Appendix III).

There is yet another set of states and union territories in which the proportion of rural population remains above 80 per cent. These states include Uttar Pradesh, Nagaland and Meghalaya. The proportion of rural population is also very high above the national average in the states of Madhya Pradesh, Haryana and Rajasthan. The rural percentage is below the national average in Andhra Pradesh, Kerala, Karnataka, Manipur, Punjab and West Bengal. It is well below the national average in Gujarat, Tamil Nadu, Mizoram, Goa and Maharashtra. The last mentioned three states have the highest degree of urbanization in India. Urbanization in India perhaps still retains its colonial heritage.

* Excluding Jammu and Kashmir as the 1991 Census was not held.

A high proportion of rural population implies that the economy is still heavily dependent on agriculture and that the traditional social order is still intact. This is certainly true for the states of Bihar, Orissa, Madhya Pradesh and Rajasthan. These states are largely underdeveloped and industrialization has not resulted in urbanization on any significant scale. The other states with a high proportion of rural population lie in the hilly and the forested tracts of the north and the north-east. Both economic development and urbanization are moving at a slow pace in these regions.

There are many districts in the least urbanized states of India which are even more rural and where an overwhelming proportion of population lives in rural areas. Some random examples have been chosen here to illustrate this point. Dhemaji in Assam has as high a rural proportion as 98.14 per cent. The rural population accounts for 94.31 per cent of the total population in Gopalganj district of Bihar, 92.87 per cent in Bastar and about 92 per cent in Jhabua districts of Madhya Pradesh and the Jalor district of Rajasthan.

Urbanization

India is one of the least urbanized countries of the world as is evident from the above discussion. However, India's urban population is the fourth largest among the countries of the world, although in terms of urban percentage India's rank is quite low. It is slightly lower than China where the overall urban percentage is 26.20. The United States of America with 75 per cent of its population living in urban areas and Brazil with 75.50 per cent, have no comparison with India. The degree of urbanization is higher in Egypt as well as Pakistan than in India — the urban

TABLE 8.1
Proportion of Urban Population 1901-1991

Years of Census	Urban Percentage*
1901	10.84
1911	10.29
1921	11.17
1931	11.99
1941	13.85
1951	17.29
1961	17.97
1971	19.00
1981	23.51
1991	25.71**

* Figures include Assam

** Including the projected urban population of Jammu and Kashmir.

percentages of the two countries being 44 and 32, respectively.

The present trend of rapid rate of urban growth in India has no parallel in its demographic history of the last 100 years or so. Even in the first four decades of the twentieth century urban growth has been very slow. The percentage of urban population at different censuses conveys this idea very well (see Table 8.1).

The degree of urbanization in three states of Maharashtra, Tamil Nadu and West Bengal suggests a significant trend. Among the inland states Punjab is the most urbanized (29.55 per cent). Of the total urban population of India more than one-half lives in just five states. These states are Maharashtra, Uttar Pradesh, Tamil Nadu, West Bengal and Andhra Pradesh. The other five states including Karnataka, Gujarat, Madhya Pradesh, Bihar and Rajasthan account for 29.81 per cent. Thus, the total for these two sets of states comes to be very high 82.10 per cent. It may be noted that Uttar Pradesh figures in this list, although it is one of the least urbanized states of India. This happens because its size of urban population is very large (27.60 million) even though its urban percentage is low (19.84 per cent). One may compare Uttar Pradesh with Maharashtra where the degree of urbanization is the second highest (38.69 per cent) among the major states in the country but its absolute urban population of 30.54 million is slightly more than that of Uttar Pradesh.

The urban population of India is distributed among 3,768 towns and urban agglomerations. These include 299 cities, 1,013 medium and 2,070 small towns. The Indian census recognises six classes of cities and towns. Class I cities have a population of more than 100,000. Class II towns have a population ranging between 50,000 and 99,999. Class III towns have a range of population from 20,000 to 49,999.

While Class IV towns have a population between 10,000 and 19,999 and Class V towns have 5,000-9,999 population. Class VI towns have a population of less than 5,000.

The towns of different size categories have an interesting distribution pattern. Of the 299 cities of India as many as 170 are concentrated in the states of Maharashtra, Andhra Pradesh, Karnataka, Tamil Nadu, Uttar Pradesh and West Bengal only. Interesting differences are observed in the distribution of urban population among towns of different size categories. It is revealed that 64.89 per cent of India's urban population lives in cities with a population of 100,000 or more. Class II and Class III towns together obtain 24.29 per cent of the total urban population. The states of West Bengal, Maharashtra, Meghalaya, Andhra Pradesh, Gujarat, Karnataka, Kerala and Tamil Nadu have a very large share of their urban population concentrated in cities. The respective percentages of these states are as follows: West Bengal - 81.71; Maharashtra - 77.35; Meghalaya - 67.54;

Andhra Pradesh - 66.88; Gujarat - 66.43; Karnataka - 64.60; Kerala - 66.34 and Tamil Nadu - 65.96. The process of agglomeration of urban population indicates a definite trend in the history of Indian urbanization.

Another striking feature of the urban scene in India is that there are 23 metropolitan cities. These metropolitan cities account one-third of India's urban population (see Table 8.2.).

TABLE 8.2
Population of Metropolitan Cities, 1991

Metropolitan City	Population (in million)
Greater Mumbai	12.59
Calcutta	11.02
Delhi	8.41
Chennai	5.42
Hyderabad	4.34
Bangalore	4.13
Ahmedabad	3.31
Pune	2.40
Kanpur	2.02
Lucknow	1.66
Nagpur	1.66
Surat	1.51
Jaipur	1.51
Kochi	1.14
Vadodara	1.12
Indore	1.10
Coimbatore	1.10
Patna	1.09
Madurai	1.08
Bhopal	1.06
Visakhapatnam	1.05
Ludhiana	1.04
Varanasi	1.03
Total Population of Metro cities	70.88

Sex Composition

The sex composition of population is often expressed as a ratio which is known as the sex ratio. It is computed as number of females per thousand males. Thus, a sex ratio of 1000 implies complete parity

between the two sexes. Ratios above 1000 indicate excess of females over males; those below 1000 indicate a deficit of females. The overall sex ratio of 927 for Indian population suggests a general deficit of females. The population of India shows a generally declining trend in sex ratio. The decline has been quite striking from 972 in 1901 to 927 in 1991. It has been observed that there is no significant disparity in sex ratio at birth. However, the proportion of females decreases soon after birth. This may be due to the fact that the male child receives a preferential treatment while the female child is generally neglected. The proportion of females also declines because of the high incidence of death among the females of all age groups. The death rate is particularly high among the married women and remains so all through their reproductive period.

Sociological factors apart, sex ratio may also reveal disparities between different regions of India due to migration. We know that long distance migration in India is generally male-selective. Males, for example, out-migrate from the sub-Himalayan states of Himachal Pradesh and Jammu and Kashmir in search of jobs to other states of India leaving their families back at home. This results in the excess of the females in these states. On the other hand, women labourers also migrate to different industrial and mining centres of the country. This affects the sex ratio both in the states of origin as well as of destination.

Very often one observes a striking difference in sex ratio between the rural and urban components of population. These differences are often caused by the out-migration of males from rural areas to urban areas.

The overall sex ratio for India, which is 927 females per thousand males shows only an average position for the country.

However, vast disparities in sex ratio exist from state to state. The states which lie above the national average do not show a favourable sex ratio for women, except Kerala which has a sex ratio of 1036. The sex ratio ranges between 976 and 931 in the twelve states which have a higher sex ratio than India as a whole. Among the states which lie below the national average, Arunachal Pradesh with a sex ratio of 859 holds the lowest rank. The states which lie above Arunachal Pradesh are Nagaland (886), Haryana (865), Punjab (862), U.P. (879), Jammu and Kashmir (923), West Bengal (917) and Rajasthan (910).

Among the union territories, Pondicherry, Daman and Diu, Lakshadweep and Dadra and Nagar Haveli have sex ratios higher than the national average. Andaman and Nicobar Islands, Chandigarh and Delhi, on the other hand, have lower sex ratio than the nation's average.

The overall picture presented by these statistics is sharply modified when we examine the sex ratios for the urban component of population. The all India average for the urban sex ratio which is 894 females per thousand males indicates a very serious disparity. The lowest sex ratios are observed in Arunachal Pradesh (728), Nagaland (740) and Sikkim (750). Likewise, the urban population in the states of Himachal Pradesh, Delhi, West Bengal, U.P., Punjab, Orissa, Madhya Pradesh, Maharashtra, Haryana and Rajasthan is highly male-dominated in sex composition.

An overview of the district-level data reveals that there are clusters of districts in western Rajasthan, western Uttar Pradesh, Delhi and its surrounding regions, eastern Rajasthan and north-western Madhya Pradesh where the sex ratios remain below the national average. The situation is just the reverse in the hilly

districts of U.P., parts of Tamil Nadu, Kerala, Karnataka, Maharashtra, Orissa and Andhra Pradesh which have an excess of females over males. Interestingly, the sex ratio in Azamgarh district of U.P. is in favour of females, i.e. 1007 females per 1000 males.

As noted earlier, sex ratios reveal inter-regional variations because of population dynamics mostly caused by uneven economic development in the country which forces the people to remain on the move.

Age Structure

The Indian census classifies population into 5-yearly age-groups for the males and females separately. These age-groups are : 0-4 years, 5-9, 10-14, 15-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, 60-64, 65-69, 70-74, 75-79 years and 80 years and above. However, on the basis of critical stages in the life of an individual, population may also be regrouped as follows : 0-14, 15-29, 30-39, 40-49, 50-59 and above 60 years. The working age-group extends from 15 to 59 years. Similarly, reproductive age group in the case of females generally extends from 15-49 years.

So far as the age structure of population is concerned about one-fourth of the total population of the country is below 10 years of age. About 21 per cent of the population belongs to the age-group 10-19 years. It is thus important to understand that 47 per cent of the country's population is less than 20 years of age. On the other end of the scale, only 7 per cent of the population is less than 60 years and above. It may be concluded that 93 per cent of the population is less than 60 years of age. Appendix IV(a) gives us an idea of the age structure of population and its male-female variation at the all India level. Appendix IV(b) shows

age structure of population by selected age-groups. A study of the Tables given in Appendix IV will reveal that 37.25 per cent of the population is below 15 years of age. Another 26.56 per cent population is in the youthful age of 15-29 years. Only 16 per cent of the population is in the middle age-group of 40-49 years. There are inter-regional and inter-state variations in age structure which can be appreciated in a study of the relevant Tables of 1901 Census.

Working Population

The proportion of workers in a population is expressed by work participation rate. It shows the proportion of workers in the total population in percentage. Participation rates may be calculated for males and females separately. There may be different definitions of a worker according to the needs of a given economy. For example, the Census of India 1981 recognised an individual as a main worker if he/she was engaged in any economically gainful work for a period of 183 days in a year and the definition remained the same for the 1991 Census also. Those workers who put in a lesser number of days in the years were classified as marginal workers.

It is understood that the working population will consist of persons in the age-group 15-59 years. However, under conditions of hardship even children below the age of 15 years and the elderly persons above the age of 60 years are forced to work. Engagement in any economically gainful work is also dependent on the availability of work. In this context the proportion of workers in a population reflects the state of the economy and the level of social well-being of population.

On the basis of the definition of a worker adopted by 1991 Census it may be noted that the average work participation rate for India was 34.09 per cent. The male

participation rate of 50.93 per cent indicated predominance of males in the workforce. The corresponding work participation rate for females is only 15.93 per cent. It is thus obvious that, on the whole, two non-workers are dependent on every worker in India. There are significant differences between the rural and urban components of population in terms of work participation rates. Thus, while 51.75 per cent of males and 18.57 per cent of females are returned as workers in rural areas, the proportion of workers declines sharply in the urban areas among both male and female segments. For example, the all India average work participation rate for women in urban areas is as low as 8.12 per cent. This reveals the state of female dependency. A little less than one-half of the rural workforce consists of cultivators. Another 31.64 per cent belong to the category of agricultural labourers. Thus, agriculture offers employment to some 80 per cent of the rural workforce. About 2.16 per cent of the workforce is engaged in handicrafts industry, while other types of work including trade, transportation and other services engaged 17.81 per cent of the workforce.

The all India average work participation rate for the overall population conceals the inter-regional variations which are very striking. In fact, these variations can be studied by considering the male and female components separately. The state-level position is that the male work participation rates remain very high in the predominantly tribal states of the North-East. The male work participation rate is as high as 53.52 per cent in Arunachal Pradesh, 50.82 per cent in Sikkim, 52.25 per cent in Andaman and Nicobar Islands, 49.54 per cent in Meghalaya and 49.39 per cent in Nagaland. The male work participation rates are also high in Tamil Nadu (56.10 per cent), Orissa

(52.86 per cent), Karnataka (53 per cent) and Haryana (48 per cent).

Females present an entirely different picture. Punjab and Haryana, the two agriculturally developed states, have the lowest female work participation rates 2.79 and 6.01 per cent, respectively. Female work participation rates do not show much of disparity with males in the tribal states of the North-East. On the other hand, the position of women is most disturbing in the states of Uttar Pradesh, West Bengal,

Rajasthan and Orissa where 7 to 13 per cent of the total female population is returned as workers.

The characteristics of the workforce in India as discussed above reveal an underdeveloped state of economy. If the developmental process was more vigorous, a large proportion of population would be employed gainfully. Perhaps, development would also bridge the vast gap between the male and female work participation rates.

EXERCISES

Review Questions

1. Answer the following questions briefly:

- (i) What are the major demographic attributes of human population?
- (ii) Which state of India is most rural in character?
- (iii) Name three most urbanized states of India.
- (iv) Which five states together constitute more than 50 per cent of the total urban population of our country?
- (v) What are the major problems of city life?
- (vi) Into how many categories have the urban centres in India been classified? Give the range of population for each size-category.
- (vii) What do you understand by the term 'sex ratio'?
- (viii) Which Union Territories have sex ratio higher than the national average?
- (ix) What percentage of Indian population falls in the age-group of below 20 years?
- (x) What do we understand by the term 'participation rate'?
- (xi) Which age-groups constitute the working population?
- (xii) Name the two agriculturally developed states having the lowest female worker participation rate.

2. Distinguish between:

- (i) Rural population and urban population
- (ii) Main worker and marginal worker
- (iii) Cultivator and agricultural labourer

3. "Though India's urban population is more than the urban population of the United States of America, it is considered one of the least urbanized countries of the world". Elaborate this statement with the help of suitable examples.

4. Discuss the trend of urbanization in India with special reference to the period since independence.

5. "The sex ratio has been generally declining ever since 1901". Critically examine the statement and give reasons for the declining trend.
6. Describe briefly the salient features of the age composition of the Indian population.
7. Discuss the main characteristics of the workforce in India. What kind of economy do they reveal and how could the level of social-being of population be raised?

Map and Practical Work

8. On the basis of the data given in Table 8.1, draw a line graph to show growth of urban population in India from 1901 to 1991.
9. On the map of India show the metropolitan cities.
10. On an outline map of India show states having excess of females over males.

CHAPTER 9

Population Composition : Ethnic and Socio-Cultural Attributes

The population of India is composed of diverse groups in terms of their ethnic and socio-cultural attributes. The incursions during the pre-historic, ancient and medieval periods have left deep imprints on our ethnic characteristics. Almost all racial stocks, with significant modifications indeed, are represented in India. There are some 67.75 million* people who are recognised as Scheduled Tribes. The tribes themselves display a very high degree of diversity in their ethnic and linguistic characteristics. This diversity is evident from the fact that the Scheduled Tribes consist of no less than 354 different communities. There are hundreds of caste groups each holding a definite position in the hierarchical ordering of our society. There is a specific geographic pattern in the distribution of major caste groups as a single group emerges as a major land-owning caste in a cluster of villages. These land-owning castes enjoy social power in villages and determine the destiny of smaller groups who are subordinate to them. There are socially and economically deprived caste groups now recognised as Scheduled Castes. Their geographical distribution provides a valuable evidence

of the regional dimension of poverty in India. The people of India communicate in multiple tongues, a diversity which has grown through the long process of peopling. Although, Grierson in his linguistic *Survey of India* exaggerated this diversity, there are still several hundred language and dialect groups who are concentrated in their own pockets of concentration. The people of India profess religious faiths from Hinduism (which is the religion of the land) to Buddhism, Jainism, Islam, Christianity and Sikhism. Besides, there are animistic and totemistic practices among the tribal groups of India. Each of these religious groups, diverse as they are, have integrated into the cultural ethos of the regions of India in which they are concentrated.

In this chapter we shall examine the geographical distribution of these ethnic and cultural groups which make India what it is and contribute to its overall unity, made up of diverse identities.

Tribal Population

It has been noted in the preceding section that the tribal communities of India display an interesting profile of the country's ethnic diversity. It is, therefore, pertinent to look closely at the general patterns of

* Excluding Jammu and Kashmir

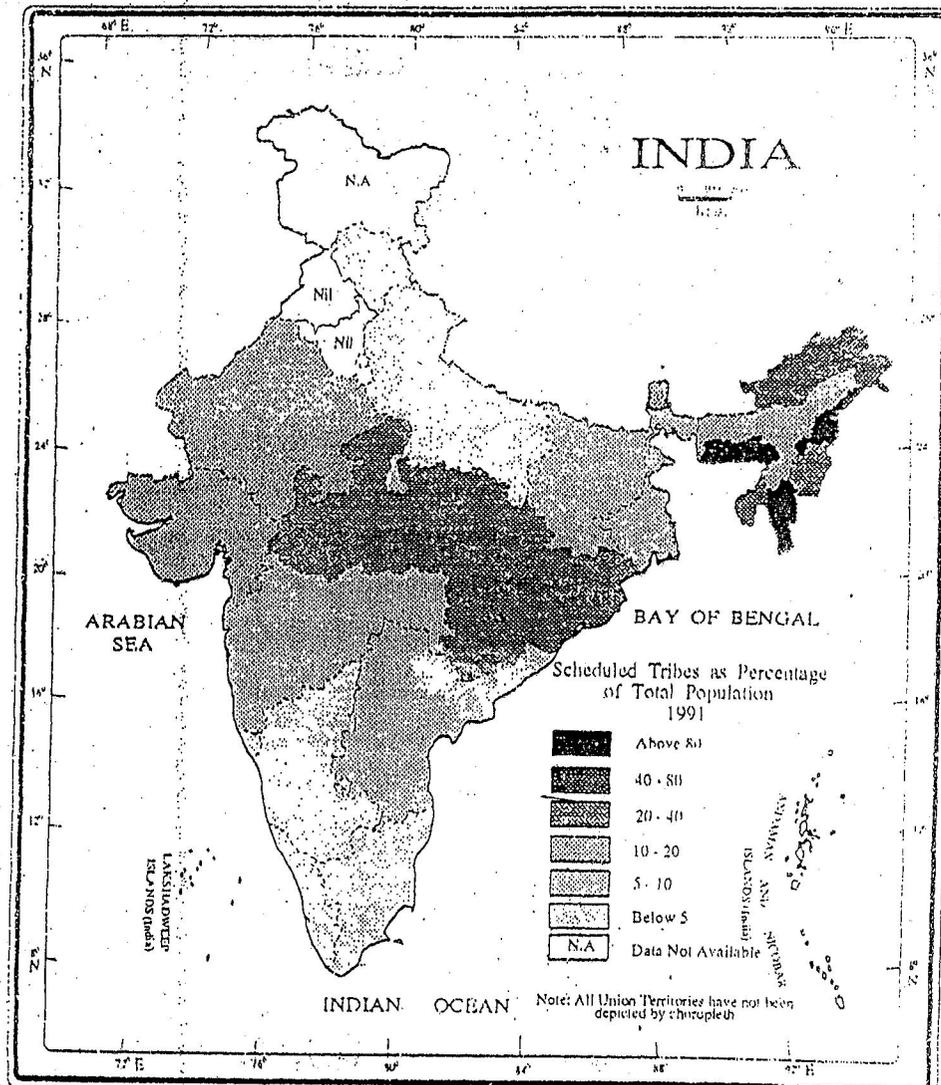


Fig. 28. India-Distribution of Scheduled Tribes Population (State-wise), 1991

1. Based upon Survey of India map with the permission of the Surveyor General of India
2. The responsibility for the correctness of internal details rests with the publisher.
3. The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.
4. The interstate boundaries between Arunachal Pradesh, Assam and Meghalaya shown on this map as interpreted from the North-eastern Area (Reorganisation) Act, 1971, but have yet to be verified.
5. The external boundary and coastline of India agree with the Record-Master Copy certified by Survey of India.

taluk, anchal or thana level, tribal population displays even a higher degree of concentration. It may be noted that there are 332 talukas/tahsils in India in which the Scheduled Tribes are in absolute majority, their share in population being more than 50 per cent. States in the North-East (Nagaland, Arunachal Pradesh, Mizoram, Meghalaya and Manipur, Dadra and Nagar Haveli in western India and the Islands are predominantly tribal in their population composition. So are parts of Gujarat, Orissa, Bihar and West Bengal.

As we move to the smallest spatial unit — the village, the pattern of tribal concentration is further sharpened. In fact, it has been observed that even in talukas where the tribes are not otherwise in majority, bulk of their population is concentrated in clusters of small hamlets which are exclusively tribal in their population composition.

The clustering and concentration of the tribal population in areas of poor accessibility and generally unfavourable environment for developed agriculture leads one to realise the implications of such a pattern of distribution. The Scheduled Tribes are by and large, living in areas which are generally backward in terms of social and economic development. On the other hand, these regions are rich in natural resources, particularly in minerals and forest produce. The need for exploiting these resources to the benefits of the nation has exposed the tribal areas during the last hundred years or so to the non-tribal groups equipped with better technology. However, this process of infiltration in tribal areas has brought about a dislocation and even destruction of the tribal forms of economy, their way of life and culture.

The policy of economic development initiated since Independence has, however,

given due consideration to the problems of tribal areas particularly the ones created by the infiltration of non-tribal population in the tribal areas. Efforts have been made to correct the old mistakes. It is further hoped that future planning for the social and economic upliftment of the tribal areas will help these groups in sharing the fruits of economic growth without destroying good qualities of their culture and without forcing them to lose their cultural identity.

Caste Groups

The origins of the Indian caste system are shrouded in the mysteries of the proto-historic period. Mythological explanation apart, caste system probably arose in an attempt by the cattle raising fair-complexioned immigrants of the second millennium B.C. to incorporate in a composite social organisation the dark-complexioned Palaeo-Mediterraneans and the Proto-Australoids, who constituted the indigenous population of India and who had already developed an agriculture-based civilization by that time. It appears, to start with, that, at least the system was based on the *Chatur Varna* — the four-fold division of the society which came to be recognised on the basis of occupation. However, there is reason to believe that ethnic considerations (particularly the skin complexion) have also played an important role in shaping the form of the caste system. This tradition is still reflected in many ways in our society today.

Whatever may have been the origins of the caste system, it became extremely hierarchical and rigid encouraging high castes to exploit toiling peasantry, artisans and the like who were mainly drawn from the middle or the lower rungs of the caste system. Very often high caste people could live as parasites on the entire community which was directly responsible for production and rendering of social services

their spatial distribution in India. The Scheduled Tribes hold a significant position. They belong to different ethnic, linguistic and religious groups and have unique social and economic characteristics. The tribal communities generally live in areas which are by and large unfavourable to sedentary agriculture. Their occupations and way of life are intrinsically linked with the environmental setting of these areas.

The 1961 Census recorded a population of little over 30 million persons as belonging to the category of Scheduled Tribes. They accounted for 6.87 per cent of the country's total population. By 1991 the numerical strength of the Scheduled Tribes rose to 67.75 million persons accounting for 8.08 per cent of the total population of the country. This happened because of natural growth of population and also because additions were made to the list of Scheduled Tribes from time to time. The tribal communities include major groups like the Santhals, Bhils and Gonds, each with a population of over 3 million as well as smaller groups consisting of a few hundred people. They are classified in terms of size in Table 9.1 below.

TABLE 9.1
Numerical Ordering of the Scheduled Tribes

Category	No. of Tribal Groups in the Category	Percentage of Total Tribal Population of India in each Category
Major	58	81.20
Medium	102	0.78
Minor	133	13.11
Insignificant	61	0.02
Unclassified	—	1.12

Source : Moonis Raza and Aljazuddin Ahmad (1990) *An Atlas of Tribal India* (Concept: New Delhi)

It is clear from Table 9.1 that there are 58 major tribal groups, accounting for 81.20 per cent of the total tribal population of India. The medium-sized tribal groups

are as many as 102 while the minor tribal groups consist of 133 communities. As many as 61 tribal communities are numerically insignificant.

Patterns of Spatial Distribution

The tribal communities depict a highly uneven pattern of distribution between the states of the Indian Union, due to their strong tendencies of clustering and concentration in the hilly and forested tracts of the country. These differences in the spatial distribution are brought out by Appendix III (also see Fig.28).

The states and union territories with rich alluvial plains favourable to agriculture — such as Punjab, Haryana, Delhi, Uttar Pradesh and Chandigarh have either no tribal population or the proportion of the tribal population is negligible. However, the case of Assam is slightly different as this state is also a part of the North Indian Plain and yet it supports a fairly sizeable tribal population. In fact, the tribal population accounts for 12.83 per cent of the total population of Assam. A second category of states consists of Kerala, Karnataka, Tamil Nadu and Andhra Pradesh, all of them lying on the Plateau. In their case, the percentage of tribal population to the total population is quite insignificant. Maharashtra, though contiguous to the block of southern states mentioned above is, however, a notable exception. In sharp contrast to the patterns noted above the Indian states of Gujarat, Rajasthan, Madhya Pradesh, Orissa and Bihar contain a high share of tribal population, the percentage ranging from 8 to 23 per cent. In these states the tribal population is not uniformly distributed. They mainly inhabit the rugged and the forested parts. The northern state of Himachal Pradesh which is quite mountainous and forested does not have a high concentration of tribal

population, i.e. 4.22 per cent.

The states of the North-East and Lakshadweep present a different case. While the absolute number of Scheduled Tribes in these states is low, their share in the total population is very high. It is generally above 80 per cent, particularly in Mizoram, Nagaland, Meghalaya and Lakshadweep. Manipur and Tripura have a comparatively lower proportion — less than 35 per cent.

Speaking in terms of the total population of the Scheduled Tribes, the states of Madhya Pradesh, Orissa, Bihar, Gujarat, Rajasthan, Maharashtra and West Bengal together account for about 80 per cent of the tribal population of the country. On the contrary, the states and Union Territories with high tribal percentages have a far lesser share in the country's total tribal population. The tribal population of Mizoram, Lakshadweep, Arunachal Pradesh, Nagaland and Meghalaya accounts for only about 6 per cent of the total tribal population of India.

District Level Patterns

The spatial distribution of the tribal population at the district level further reveals their tendency of clustering and concentration.

There are twenty-four districts in which the Scheduled Tribes hold a dominant position. Twenty-one of these districts lie in the North-East. Others include the Lakshadweep, the Dangs districts of Gujarat and Jhabua district of Madhya Pradesh. In all these districts, the share of tribal population to the total population is above 80 per cent.

The share of the tribal population ranges between 50 and 80 per cent of the total population in Dhar, Mandla, Surguja and Bastar districts of Madhya Pradesh; Sundargarh, Mayurbhanj and Koraput districts in Orissa; Lahul and Spiti and

Kinnaur districts of Himachal Pradesh; Dungarpur and Banswara in Rajasthan; Lohardaga, Gumla and Paschim Singhbhum in Bihar and Valsad in Gujarat. Several districts in the North-East such as Tawang, West Kameng, Lower Subansiri, West Siang and East Siang districts of Arunachal Pradesh, Karbi Anglong and North Chachar Hills in Assam and Senapati, Ukhrul and Tamenglong districts of Manipur fall in the same percentage range. Together these districts account for 27.06 per cent of the total tribal population of the country.

The proportion of tribal population varies from 20 to 50 per cent of the total population in one district each of Himachal Pradesh and Tripura, twelve districts of Madhya Pradesh, four districts of Gujarat, four districts of Orissa, three districts of Maharashtra, five districts of Rajasthan, one district of West Bengal and five districts of Bihar.

The number of districts goes on increasing and the spatial distribution of tribes is more and more scattered, as the tribal share in population decreases. There are 39 districts which have a significant proportion of the tribal population: 83 districts where the share of the tribal population ranges between low to marginal and 119 districts where it is negligible. Thus, it can be seen that about two-thirds of the tribal population lives in only 72 districts. It is interesting to note that about one-third of the total tribal population of India lives in just 20 districts. These districts include Ranchi, Gumla, Paschim Singhbhum (Bihar); Koraput, Mayurbhanj (Orissa); Bastar, Surguja, Jhabua, West Nimari, Bilaspur and Raigarh (Madhya Pradesh); Surat, Valsad, Panchmahals, Vadodara (Gujarat); Dhule, Thane, Nasik (Maharashtra); and Udaipur and Banswara (Rajasthan). When we move down to yet smaller units from the district to the taluk,

Correspondence between Social & Economic Categories in Rural India during the Pre-Independence Period

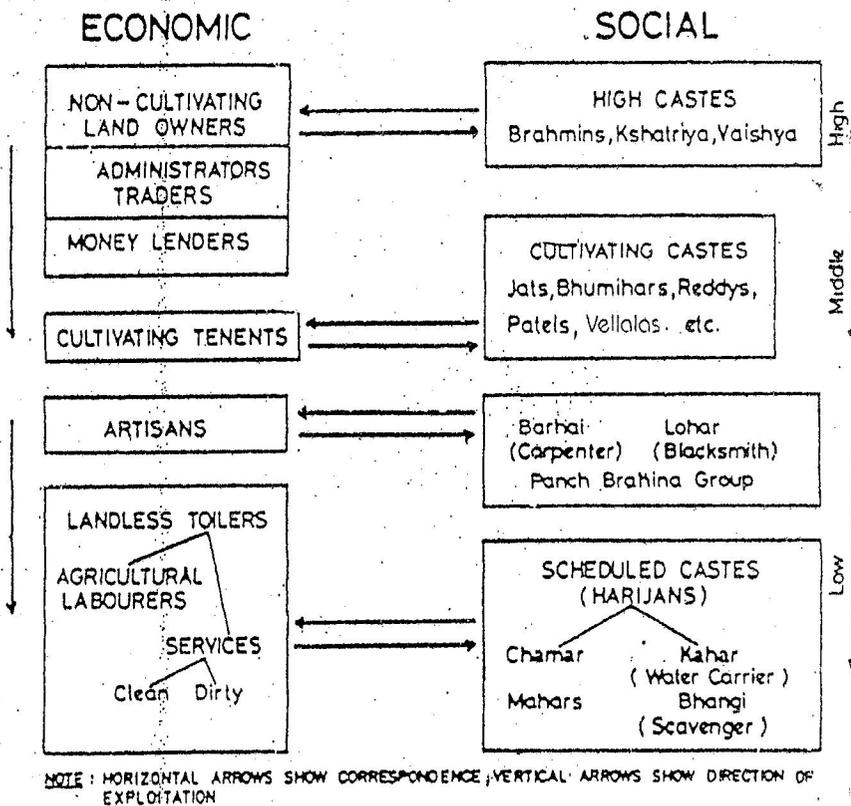


Fig. 29 Correspondence between Social and Economic Categories in Rural India during Pre-independence Period

total population ranges between 20 and 50 per cent in 108 districts of India. This group of districts includes 37 districts of UP, 12 districts of MP, all the 12 districts of Punjab, 10 districts each of Himachal Pradesh and West Bengal, 4 districts of

Bihar, 6 districts each in Haryana and Rajasthan, 5 districts of Tamil Nadu, 3 districts of Karnataka, 2 districts of Andhra Pradesh and one district of Orissa. Scheduled Castes are highly concentrated in the districts of Kooch Bihar, Jalpatguri

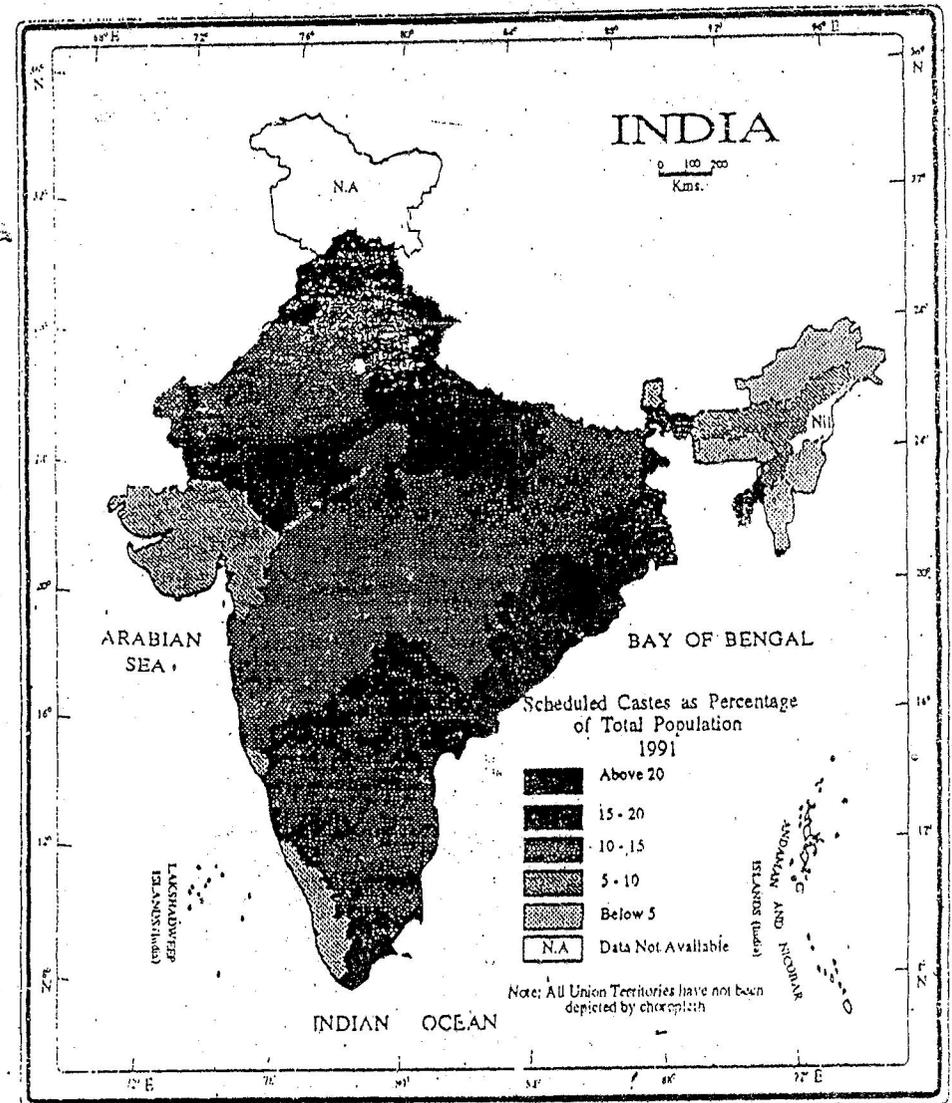


Fig. 30. India: Distribution of Scheduled Castes Population (State-wise), 1991

1. Based upon Survey of India map with the permission of the Surveyor General of India
2. The responsibility for the correctness of internal details rests with the publisher.
3. The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.
4. The interstate boundaries between Arunachal Pradesh, Assam and Meghalaya shown on this map as interpreted from the North-eastern Area (Reorganisation) Act, 1971, but have yet to be verified.
5. The external boundary and coastline of India agree with the Record/Master Copy certified by Survey of India.

needed by the community. Figure 29 is a simple and a highly generalised model of the complex system, bringing out the correspondence between social and economic categories in rural India. The model is applicable to the situation in the pre-independence period. Since 1947, the system has undergone change particularly as a result of the implementation of agrarian reforms. But the caste-based prejudices have not disappeared. The following modifications may be referred to:

First, a substantial number of non-cultivating land owners and the bulk of cultivating tenants have become cultivating owners. But non-cultivating ownership persists through various forms of share-cropping especially in the eastern region; and the system of bonded labour continues in many pockets in a clandestine manner. Second, a considerable number of Scheduled Caste groups is being squeezed out of the village and they now earn their living as workers especially in 'polluted' industries like leather tanning and shoe-making.

It may, however, be said that, in spite of a certain amount of vertical and horizontal mobility, the general correspondence between economic and social backwardness still continues.

Though there is a wide prevalence of the above model in all parts of non-tribal India, the system of economic inequalities has been encapsulated, so to say, in regional moulds. The *Saryupatis* of Awadh, *Namboodiris* of Kerala, *Chitpavans* of Maharashtra, *Chattopadhyas* of Bengal and *Iyengars* of Tamil Nadu are all Brahmins; but these categories are essentially regional. In the same way, the *Jats* of Haryana, the *Bhumihars* of Bihar, the *Reddys* of Andhra Pradesh and the *Vellalas* of Tamil Nadu are all cultivating castes; but the regional structure and boundaries which are generally recognised,

especially for inter-marriages. These regional models are more important. The same is true of the deprived components of the caste system. The *Chamars* of Uttar Pradesh, the *Balats* of Bengal, the *Meghas* of Gujarat, the *Mahars* of Maharashtra, the *Malls* of Andhra Pradesh or the *Adi-Dravidas* of Tamil Nadu are all Scheduled Castes but they are all concentrated in specific regions and have their identity in the caste hierarchy of these regions. It is, therefore, clear that, in spite of its wide prevalence, the caste system is, in many ways, also a regional phenomenon. The status and position of every caste group may be determined on all India scale of social hierarchy; but the caste group itself, in many important respects is very much a regional category. In this sense, it is an element in the process of regional differentiation in the social geography of India.

The spatial distribution of the Scheduled Castes and its economic correlates deserve particular attention because it helps us to understand one of the important facets of the regional dimension of rural poverty. About 90 per cent of the Scheduled Castes of the country live in rural areas. They provide substantial support to Indian agriculture as the labour force. The occupational structure of the Scheduled Caste workforce is, by and large, made up of the following components:

1. Landless agricultural labourers,
2. Cultivators with small land holdings,
3. Small commodity producers or artisans,
4. Services particularly 'polluting' or 'dirty' services, and
5. Industrial workers, working mainly in industries related with their traditional crafts like leather tanning, shoe-making, etc.

According to the 1991 Census of India there were 138.22 million persons

belonging to the Scheduled Castes. They accounted for 16.54 per cent of the total population of the country. There are, however, vast differences in the concentration pattern of the Scheduled Castes in the different regions of the country. The fact that these castes are associated with agriculture explains their main concentration in the alluvial and the coastal plains of the country. The hilly and the forested tracts and the tribal belt of the central and North-Eastern India have only a sparse population of the Scheduled Castes.

Distribution at the State Level

At the state level, in terms of absolute numbers, the highest concentration of the Scheduled Castes is found in the two northern states of Uttar Pradesh and West Bengal (see Appendix VI). The states with a medium level of concentration include Bihar, Tamil Nadu, Andhra Pradesh, Karnataka, Punjab, Rajasthan, Madhya Pradesh, Maharashtra and Orissa. The states of Himachal Pradesh, Assam and Kerala fall under the category of low concentration. However, the proportion of scheduled caste population in the total population of states reveals a different pattern altogether (Fig. 30), for example, Punjab and Himachal Pradesh have the highest percentage of scheduled caste population, i.e. 28.31 and 25.34 per cent, respectively.

Distribution at the District Level

As already noted the Scheduled Castes are mostly living in the rural areas. Let us look a little more closely at the distribution pattern of the rural Scheduled Castes in the different regions of the country.

The distribution of the rural Scheduled Castes in India at the district level leads

* Excluding Jammu and Kashmir where 1991 Census was not held.

to the identification of the following zones:

1. Areas of High Concentration

There are two major areas with high concentration of the Scheduled Castes.

(a) *Indo-Gangetic Plain*: The Scheduled Castes display a strong tendency of concentration in the alluvial plains of the north.

The plains are endowed with fertile soil, good water supply and a climate suited to the cultivation of a large variety of crops. The intensive agriculture, that has developed over these plains, absorbs a high number of agricultural labourers. This labour force is contributed by the Scheduled Castes.

(b) *The Coastal Plains*: The coastal plains of the south have almost the same opportunities for the settlement of peasant communities. The Scheduled Castes are mainly concentrated in the east and the west coast of India from Orissa to Gujarat.

2. Areas of Medium Concentration

The Scheduled Castes are moderately concentrated in the districts adjoining the zone of high concentration, noted above.

3. Areas of Low Concentration

There is a considerably low concentration of the Scheduled Castes in the Central Vindhyan complex, Chhotanagpur plateau, Western dry region of Rajasthan, the hilly tracts of Uttar Pradesh and Himachal Pradesh and the North-East. The concentration is also low in the coastal parts of Karnataka and Maharashtra. As is evident there are vast areal contrasts in the distribution and relative concentration of these castes.

Based on the distribution pattern of the Scheduled Castes at the district level, the following patterns can be identified. The proportion of Scheduled Castes in the

and south Twenty Four Parganas of West Bengal, Sonbhadra and Sitapur of UP, Jalandhar, Hoshiarpur and Faridkot of Punjab where one-half to one-third of the district populations are constituted by Scheduled Caste. Other districts of India with a high proportion of Scheduled Castes are Bankura (31.37 per cent) Sitapur (32.22 per cent), Hardoi (31.55 per cent) and Ganganagar (29 per cent).

The Scheduled Castes are either conspicuous by their absence or have very small population in the predominantly tribal states of Manipur, Meghalaya, Nagaland, Arunachal Pradesh, Mizoram and the Lakshadweep.

It is interesting to note that the percentage of rural Scheduled Caste population to the total rural population is generally related inversely with (i) the percentage of rural Muslims, Sikhs and Christians, and (ii) the percentage of rural tribal population to the total rural population. This indicates, at least partly, an attempt on the part of the deprived to escape the rigours of the inequities of the caste system. They, however, escaped it only marginally because their socio-economic deprivation was and continues to be essentially a function not of their religious faith but of their status in the agrarian structure, which can be changed only through basic transformation. The tribal communities have escaped the inequities of the caste system by perpetuating their weakly stratified structures and have paid a heavy price for it in terms of technological backwardness.

About one-third of the Scheduled Caste agricultural workforce is composed of agricultural labourers. But this share is highly variant in space. In the Palghat district of Kerala, it is as high as 96 per cent; and in five other districts of Kerala, it is over 80 per cent. A scatter diagram showing distribution of Scheduled Castes,

on the one hand, and the agricultural labourers, on the other, indicates a high positive correlation between the two. Rank correlation between the two also gives a positive and significant value at 95 per cent level. This analysis shows that social and economic deprivation interpenetrates each other and imposes a double burden on the deprived.

It is clear from the above that problems of regional development in India are, in important respects, linked with agrarian reforms. Much has been done in this sphere since 1947. But much more has to be done particularly in areas of high concentration of Scheduled Caste population in order to relieve them from the clutches of poverty and ruthless exploitation.

Language and Dialect Groups

The people of India display a high degree of diversity in their languages and dialects. These diversities have through a long process of peopling of the sub-continent by heterogeneous ethnic groups drawn from neighbouring regions situated in Western, Central or Eastern Asia. There is a broad social integration among all the speakers of a certain language. In the beginning languages and dialects developed in the different regions of the country in a state of isolation. The language and the dialect thus play a significant role in defining the elements of regional identity of the people.

After independence, language was recognised as the basis of state formation. The distribution pattern of major language groups was considered as a satisfactory basis for the formation of states. This has given a new political meaning to the geographical patterning of linguistic identity in the country. After independence, the most comprehensive data on languages was collected at the time of 1961 Census

of India. According to the 1961 Census there were 187 languages spoken in different parts of the country. This is, however, not surprising considering a large number of people inhabiting a vast country like India. The picture becomes less confusing when it is noted that as many as 94 of these 187 languages are spoken by less than 10,000 persons each, and that 23 languages together account for 97 per cent of the total population of the country. Of these 23 languages, 18 languages besides English have been specified in the Eighth Schedule of the Constitution of India.

Classification of Indian Languages

The languages spoken by the people of India belong to the following four language families.

1. Austric Family (Nishada)
2. Dravidian Family (Dravida)
3. Sino-Tibetan Family (Kirata)
4. Indo-European Family (Aryan)

It is interesting to note that the strength of the four families is very uneven. The proportionate share of the different language families is as follows — Aryan languages 73%; Dravidian languages 20%; Austric languages 1.38%; and the Sino-Tibetan languages 0.85% (see Fig. 31a and b).

Austric Languages

The Austric languages of India belong to the austri-Asiatic sub-Family. This sub-family is further divided into two main branches: (a) Munda, and (b) Monkhmer. The Monkhmer branch consists of two groups, Khasi and Nicobares. The Munda branch — the largest of the austric dialect consists of fourteen tribal dialects. The Austro-Asiatic is spoken by more than 6 million people. The largest single group is that of Santali speakers, who alone account for more than one-half of this total.

There are seven groups within the Austric family having a population of more than 100,000 persons each:

Sino-Tibetan (Kirata) Languages

The speakers of the Sino-Tibetan family in India belong to the three main branches — (i) Tibeto-Himalayan; (ii) North-Assam; and (iii) Assam-Myanmari (Burmese).

The Tibeto-Himalayan branch consists of the following: (i) Bhutia Group; and (ii) the Himalayan Group. The Bhutia group includes Tibetan, Belti, Ladakhi, Lahuli, Sherpa and Sikkim Bhutia. The Himalayan group consists of Chamba, Kanauri and Lepcha. Ladakhi has the largest number of speakers followed by Sikkim Bhutia and the Tibetan. In the Himalayan group, the speakers of Kanauri have the highest numerical strength.

The North-Assam or Arunachal branch includes among others the following six speech communities: (i) Aka, (ii) Dala, (iii) Abor, (iv) Miri, (v) Mishmi, and (vi) Mishing.

Among them Miris has the largest number of speakers.

The Assam-Myanmari (Burmese) branch of the Sino-Tibetan family is divided into the following groups:

- (i) Bodo or Boro
- (ii) Naga
- (iii) Kachin
- (iv) Kukichin
- (v) Myanmar (Burma) group

Each of these groups consists of several speech forms. Among them the Naga group displays the highest degree of diversity. The numerical strength of different groups varies greatly. There are as many as six speeches having a numerical strength varying between one and seven lakhs. Manipuri has the largest number of speakers. Other speech forms falling in this category include Garo, Boro,

Tripuri, Mikir and Lushai (Mizo).

Dravidian Languages

The Dravidian family of languages consists of a number of groups which are given below:

1. South-Dravidian
2. Central-Dravidian, and
3. North-Dravidian

The South-Dravidian group includes the major languages of South India, such as Tamil, Malayalam, Kannada as well as the minor languages or dialects such as Tulu, Kurgi and Yerukala. The Central Dravidian group mainly consists of Telugu and Gondi. It also includes minor speech communities such as Kui, Parji and Khond. The Northern Dravidian group consists of Kurukh (Oraon) and Malto.

It may be noted that the Dravidian languages are less diverse than the other language families of India mentioned above. The major language groups such as Tamil, Telugu, Kannada and Malayalam themselves account for 96 per cent of the total Dravidian speaking population of the country.

Aryan Languages

A substantive population of India speaks one or the other forms of the Aryan languages. They are divided into two main branches: Dardic and Indo-Aryan.

The Dardic group includes Dardi, Shina, Kohistani and Kashmiri. With the only exception of Kashmiri whose speakers have a strength of more than two million none of these speeches are spoken by a population of more than 7,000.

The Indo-Aryan branch is divided into the North-Western, Southern, Eastern, East-Central, Central and Northern groups. The North-Western groups includes Lhanda, Kachchi, and Sindhi. The Southern group includes Marathi and Konkani. The Eastern group includes

Oriya, Bihari, Bengali and Assamese. Among the important dialects of Bihari are Maithili, Bhojpuri and Magadhi. The East-Central group consists of (a) Avadhi, (b) Bagheli, and (c) Chhattisgarhi.

The Central group includes Western Hindi (*Khari Bolt*), Punjabi, Rajasthani and Gujarati. The Rajasthani itself consists of several dialects, the principal of them being Marwari, Mewari and Bagari. The speeches that fall in the Northern group consist of one or the other variety of Pahari speeches. They include Nepali, Central Pahari and Western Pahari.

Geographical Distribution

The languages belonging to the four families described above have a peculiar pattern of geographical distribution.

The speeches of the Austric family are spoken by the tribal groups in the Khasi and Jaintia hills of Meghalaya and the Nicobar Islands in the Bay of Bengal as well as in the predominantly tribal districts of Santal Parganas, Mayurbhanj, Ranchi, East Nimar, Betul and Baudh Khondmals. Of the two groups speech of Mon-Khmer, Khasi is confined to the Khasi and Jaintia hills, and Nicobarese to the Nicobar Islands. The Munda speakers, on the other hand, are concentrated in the other districts mentioned above.

The languages and the dialects belonging to the Sino-Tibetan family are confined to the North-East and the Himalayan and the sub-Himalayan regions of the North and North-West. The speakers of the Tibeto-Himalayan branch are concentrated in Ladakh and parts of Himachal Pradesh and Sikkim. Similarly, the Assam-Myanmar (Burmese) branch is confined to the North-East India, particularly in regions bordering Myanmar. Among these, Naga dialects are spoken in Nagaland, Lushai in Mizo hills, Garo in Garo hills and Metel in Manipur.

The Dravidian family languages have their zone of concentration in the Plateau region and the coastal plains. Telugu is spoken in Andhra Pradesh; Tamil in Tamil Nadu, Kannada in Karnataka and Malayalam in Kerala. The languages of the Dravidian family are also spoken by a large number of tribal groups in the eastern and the north-eastern parts of the Peninsular Plateau. These tribal groups include the Gonds of Central India and the Oraons of the Chhotanagpur Plateau.

Languages of the Indo-Aryan family have their zone of concentration in the plains of India. The domain of Indo-Aryan languages, however, extends over the Peninsular Plateau also, encompassing Gujarat and Maharashtra and reaching as far south as the Konkan coast.

Hindi is the principal language of the Indo-Aryan family. Hindi is spoken in Uttar Pradesh, Madhya Pradesh, Bihar, Rajasthan, Haryana, Himachal Pradesh and the Union Territory of Delhi. Urdu is closely akin to Hindi and is widely spoken in this belt. A major concentration of the Urdu speakers is found in Uttar Pradesh, Bihar and Delhi. A section of population in Andhra Pradesh and Karnataka also declare Urdu as their mother-tongue.

The speeches belonging to the north-western group of the Indo-Aryan family, such as Kachchi and Sindhi are spoken in Gujarat and Rajasthan. Marathi is a language of the Southern group of the Indo-Aryan family. The languages of the eastern group (Oriya, Bengali and Assamese) are spoken in Eastern India. The languages of the Central group are confined to Punjab, Rajasthan and Gujarat. The Himalayan and the sub-Himalayan areas are inhabited by the speakers of the various forms of Pahari and the Nepali which belong to the northern group of the Indo-Aryan family.

Linguistic Regions

The geographical distribution of the major languages in India neatly fits into a scheme of linguistic regions. Based on the principle of numerical strength about a dozen major languages constitute the principal linguistic regions. However, the tribal languages do not fit into this scheme as the tribal groups are concentrated in enclaves in central, eastern and north-eastern parts of the country. The regional mosaic of the tribal languages is highly complex and does not lend itself to a simple scheme of regionalization. Broadly speaking the principal languages of India constitute the following twelve linguistic regions:

Kashmiri	: Valley of Kashmir
Punjabi	: Punjab and adjoining parts of Haryana
Hindi	: Himachal Pradesh, Haryana, Rajasthan, Delhi, UP, MP, Bihar
Bengali	: West Bengal, parts of Tripura
Assamese	: Assam
Oriya	: Orissa
Gujarati	: Gujarat
Marathi	: Maharashtra
Kannada	: Karnataka
Telugu	: Andhra Pradesh
Tamil	: Tamil Nadu
Malayalam	: Kerala

Besides these twelve languages, the Eighth Schedule of the Indian Constitution also mentions the following languages — Sanskrit, Urdu, Manipuri, Konkani, Nepalese and Sindhi.

The tribal languages are so distributed that either they have their own small clusters or they overlap the regions of major languages mentioned above. In the North-East, however, the tribal speeches

such as those of minor groups in Arunachal Pradesh have almost knife-edged boundaries of their own.

The twelve linguistic regions identified above generally correspond with the States of the Indian Union. But the State boundaries do not always correspond with the linguistic boundaries. In fact, the linguistic boundary in itself is not a line but a zone of transition over which one language gradually loses its dominance and gives way to the other.

Unifying Influences

The above description of the linguistic diversity in the country should not overlook the fact that there have been strong forces of integration at work. The process of social interaction between the different linguistic groups over centuries appears to have led to the development of a common all India vocabulary. Historically, this process of integration was promoted by Sanskrit, Persian and English at one or the other point of time.

Sanskrit exercised a binding role between the Indo-Aryan languages themselves on the one hand, and the Indo-Aryan and the Dravidian on the other. During the medieval period Persian influenced the indigenous languages, particularly Marathi, Kannada, Telugu, Tamil and Bengali. English has played a similar role in modern times.

Both Hindi and Urdu have made a significant contribution to the process of linguistic integration in contemporary India. Hindi films for example, are popular in all parts of India.

Religious Composition

An important aspect of India's population is the multiplicity of religious faiths. It is commonly known that the religion of the land is Hinduism. However, Hinduism has interesting regional forms and each cultural region displays its own

distinguishing traits. The early pre-Vedic Hindu religion, which inherited elements of tribal religious faith got modified in the Vedic period towards the middle of the second millennium B.C. India witnessed successive penetration by other religions (Christianity, Judaism, Zoroastrianism, Islam) and sections of Indian population embraced these faiths from time to time. The earliest to appear was Christianity. Historical records show that the Syrian Christians appeared on the west coast of India in the very first century of the Christian era. The Arab traders brought the message of Islam to the people of India living on the west coast much before the Muslim conquest of India. Buddhism which was once upon a time a major religion of the land is today confined to a few pockets only. Sikhism is the last to appear on the scene.

It is thus obvious that the religious composition of population has been changing with conversions from one faith to another. The spatial pattern of distribution of different religious groups has also been affected by large scale migration following partition of India in 1947. Partition brought about a significant change in the distribution and relative strength of different religious faiths in Northern, North-Western and North-Eastern India.

The religious groups of India include Hindus, Muslims, Christians, Sikhs, Buddhists and Jains, although other religious faiths such as Judaism and Zoroastrianism are also represented. Several tribal communities adhere to animism and totemism. Hindus account for 82 per cent of the total population. They are distributed in all parts of India. However, in some districts they are less numerous than the Muslims, Christians,

Sikhs or Buddhists. The Muslims are the largest minority group and account for 12.12 per cent of the total population. The proportion of Christians is 2.34 per cent while Sikhs account for 1.93 per cent of the total population. Buddhists and Jains account for 0.76 and 0.39 per cent of the total population, respectively. It may be noted that while Hindus are found everywhere other religious groups have their concentration in a few pockets only.

Hindus

If one examines the percentage of Hindus to total population by districts it is evident that excepting the peripheral areas of the country and a few pockets in the interior of the country, Hindus remain the most numerous groups everywhere. In many parts of the country such as a few districts of Orissa and Madhya Pradesh the proportion of Hindu population goes up to 95 per cent or even above. In the sub-Himalayan districts of Uttar Pradesh and Himachal Pradesh the proportion of Hindu population is high above 95 per cent. The Hindu percentage remains well above 90 per cent in eastern Madhya Pradesh, eastern Gujarat, southern Karnataka, Tamil Nadu and coastal Andhra Pradesh. There are, however, certain districts on the west coast where the Hindu percentages fall below 70 per cent and even below 50 per cent. This happens mainly because of the concentration of Muslims and Christians. Hindus are also less numerous in the districts of Punjab particularly in Ludhiana, Amritsar, Ferozepur, Gurdaspur, Kapurthala, Bhatinda and Patiala where they have been outnumbered by Sikhs. On the other hand, they are a very small minority in the Valley of Kashmir. In some districts of the Kashmir Valley their proportion may be as low as 2 per cent. In the predominantly tribal areas of North-

East India, Hindus lose their dominance to Christians. In Meghalaya and Nagaland as well as Mizoram the proportion of Hindus may be anything between 5 and 20 per cent.

Muslims

According to the 1991 Census, Muslim population numbered 101.59 million which accounted for 12.12 per cent of the country's total population. This excludes the Muslims of Jammu and Kashmir where no census was held in 1991. The major areas of Muslim concentration are situated in the Kashmir Valley, parts of the upper Ganga plain (Uttar Pradesh) and a number of districts in West Bengal where the Muslim proportion ranges between 20 and 46 per cent. In Murshidabad (West Bengal), the Muslim proportion goes as high as 61.40 per cent. In the upper Ganga Valley, Muslims are fairly predominant in several districts. The districts of Rohilkhand (Uttar Pradesh), for example, have a very significant concentration of Muslims with the percentages ranging between 16 and 48. Among these districts Rampur has the highest percentage 47.95 followed by Moradabad (42.70), Bijnor (40.35), Bareilly (32.79), and Pilibhit (23.12). A similar pattern is observed in the upper Ganga-Yamuna doab. The proportion of Muslims in the total population in this region varies between 10 and 37 per cent. Saharanpur with 36.12 per cent of its population, ranks first. It is followed by Muzaffarnagar (34.52 per cent), Meerut (27.49 per cent), and Ghaziabad (21.16 per cent).

The concentration of Muslims in the Valley of Kashmir is a significant feature. In these districts Muslim proportion remains above 90 per cent all through the valley. In the districts surrounding these pockets of high concentration Muslims remain significant in terms of their numerical strength. This information is,

however, based on the 1981 Census. Other pockets of Muslim concentration are located in Gujarat, Rajasthan, Madhya Pradesh, Andhra Pradesh and Kerala.

Christians

Of the 19.64 million Christians of India, about 29 per cent live in the state of Kerala alone. Other areas of Christian concentration are in Goa and Tamil Nadu. In Kottayam and Idukki districts of Kerala, Christians account for 45.83 and 43.23 per cent of the total population, respectively. There are several other districts in Kerala where the Christian population ranges between 15 and 25 per cent. About 30 per cent of population of Goa consists of Christians. Several tribal districts of Orissa and Bihar have significant proportion of Christian population. Likewise, Meghalaya, Mizoram, Nagaland and Manipur have very high proportion of Christians. In Nagaland for example, their share in the total population is as high as 87.47 per cent. Mizoram with 85.73 per cent of its population consisting of Christians follows closely. Percentages remain very high in the districts of Meghalaya and some districts of Manipur (between 50 and 98 per cent). Several districts of UP and Punjab have small Christian population. Gurdaspur, with 6.86 per cent of its population being Christian, is a significant example.

Sikhs

The 1991 Census returns show that there are 16.25 million Sikhs in the country. While there is no part in India where the Sikhs are not found their major concentration is seen in the states of Punjab and neighbouring districts of Haryana. This is obvious because Sikhism arose from the soil of Punjab. Their present

concentration should, however, be seen in the context of India's partition in 1947 and the exodus of Sikhs from west Punjab which followed. Sikhs have an absolute majority in the districts of Amritsar, Kapurthala, Ferozepur, Gurdaspur, Bhatinda, Patiala, Ludhiana, Sangrur and Patidkot. In Jalandhar and Ferozepur districts their proportion ranges between 44 and 57 per cent. They constitute some two-fifths of the total population of Hoshiarpur district. Minor pockets of Sikh concentration are found in the Tarai region of UP, Ganganagar, Alwar and Bharatpur districts of Rajasthan. Sikhs account for 4.84 per cent of the total population of the Union Territory of Delhi. In the urban areas of other states, Sikhs live in small numbers.

Buddhists, Jains, and Parsis

India has about 6.38 million Buddhists, 3.55 million Jains, and about 72,000 Parsis. Of the total Buddhists of India, 79 per cent live in Maharashtra alone. These are Neo-Buddhists who embraced this religion after large scale conversion under the influence of the movement launched by Baba Saheb Ambedkar. The main pockets of traditional Buddhism, however, lie in Ladakh, Himachal Pradesh, Sikkim, Arunachal Pradesh and Tripura.

Of the total Jain population of India, 28.80 per cent live in Maharashtra, 16.78 per cent in Rajasthan and 14.65 per cent in Gujarat. These three states account for 60.23 per cent of the Jain population of the country. An interesting feature of the distribution of Jains is that their majority lives in the urban areas. The Parsis are the smallest religious group. They are most concentrated in western parts of India in Maharashtra and Gujarat.

Regional Synthesis

India presents an example of remarkable cultural synthesis where the people belonging to different religious faiths have been united together by a common cultural tradition which places a stamp of their regional identity. Hindus, Muslims and Sikhs in Punjab, for example, are Punjabis

first and anything else later. This is true for all other cultural regions of India from Kashmir to Kerala and from Gujarat to Assam. Religion, therefore, displays a diversity in ritual practices only. The underlying unity of the people of India is more important than their division in various religious groups.

EXERCISES

Review Questions

1. Answer the following questions in brief:

- (i) How do we classify the population into Scheduled Castes and Scheduled Tribes?
- (ii) What is the percentage of Scheduled Tribe population in India according to 1991 Census?
- (iii) Name two major tribal groups.
- (iv) Name seven states of India which together account for 80 per cent of the tribal population of the country.
- (v) What was the basis of the four classes of society during ancient times? Name the four classes.
- (vi) What do you understand by the system of bonded labour?
- (vii) Name the three states of India having a large Scheduled Caste population.
- (viii) Why are the Scheduled Castes mainly concentrated in the alluvial and the coastal plains of the country?
- (ix) Why do the people of India display high degree of diversity in their languages and dialects?
- (x) Why was the distribution pattern of major language groups considered as one of the important basis for the formation of states in our country?
- (xi) Name 18 major languages which have been specified in the Eighth Schedule of the Indian Constitution.
- (xii) Which are the four language families of India in which all the languages spoken by the people of India can be classified?
- (xiii) Which language family is predominant in India?
- (xiv) Name the largest single groups in India which speaks the Austro-Asiatic languages.
- (xv) What are the four major languages of the Dravidian family?
- (xvi) When and where did Christianity first appear in India?
- (xvii) Which state of India has the largest percentage of Buddhist population?
- (xviii) Name the six major religious groups of India.
- (xix) Which two factors greatly influence the religious composition of population?

2. Elaborate the following statements giving suitable examples.
 - (i) The tribal population depicts a highly uneven distribution between the states of the Indian Union.
 - (ii) The Scheduled Castes display a strong tendency of concentration in the alluvial plains of the north.
 - (iii) Sanskrit, Persian and English have played important role in the process of national integration.
 3. The tribal communities of India display an interesting profile of the country's ethnic diversity'. Comment.
 4. Discuss briefly the economic factors that determine the distribution of Scheduled Castes in India.
 5. The linguistic regions generally correspond with the states of the Indian Union but the state boundaries do not always correspond with the linguistic boundaries. Explain with the help of suitable examples.
 6. Discuss the religious composition of Indian population and its spatial distribution.
- Map and Practical Work**
7. On an outline map of India, show the following:
 - (i) Two states with high concentration of tribal population.
 - (ii) Areas of high and low concentration of tribal population.
 - (iii) Show the areas where Sino-Tibetan languages are spoken.

CHAPTER 10

Human Settlements and House Types

HUMAN POPULATION lives in villages and towns of different shapes and sizes distributed over the surface of the earth. The basic unit of residence is a house which may be a hut or an elaborately built house, a mansion or an apartment. Clusters of houses make a settlement which may consist of hamlets of 6 to 12 huts or compact villages accommodating ten, twenty or a few hundred houses. Settlements may also consist of even bigger agglomerations such as towns or cities. Large cities called metropolises or megalopolis are all examples of large settlement types. The term, settlement thus refers to a grouping of houses or huts with a certain layout plan. It includes the building meant for residential or other purposes, such as pens for animals or stores for equipment or machinery, as well as the streets or the roads which connect them together. It is customary to distinguish between rural and urban settlements, on the basis of their primary functions. This distinction is necessary because people in a rural settlement are largely dependent on agriculture. A rural village has a small size as it cannot support a very large population. Urban settlements, on the other hand, have non-agricultural functions and can accommodate a very large population. Calcutta or Delhi are examples of large urban settlements, where

several thousand people live over a single hectare of land.

Rural Settlements

As noted earlier a settlement consists of houses as well as the streets. The surrounding farm land is also considered to be a part of the rural settlement. The farm land may belong to different families who divide it according to their own choice and under the given circumstances making a variety of field patterns. Rural settlements may differ among themselves on the basis of type and the pattern they form. A common type of rural settlement is a village which predominates in many parts of the world. People in the hilly and forested parts of the world live in dispersed or isolated settlements. A typical example of the dispersed type of settlements is a farm stead which is so common in North America. In India the rural settlements vary from one region to the other (Fig. 32). From the undulating hilly and the forested tracts to the extensive alluvial plains and deltas one observes a distinct variation in their shapes, sizes and layout plans. In broad terms the rural settlements in India may be classified into the following types :

- (a) clustered, agglomerated or nucleated
- (b) semi-clustered, and
- (c) dispersed or isolated

The clustered type is generally characterised by a compact block of rural dwellings, with narrow, winding streets separating the two rows of houses. Very often such settlements have a definite layout plan which may be linear, rectangular, L-shaped, and so on. The semi-clustered or partially agglomerated rural settlements generally have a small but compact nucleus around which the hamlets are dispersed forming a ring around the main settlement. If the houses are situated along a road the settlement forms a linear pattern. In a dispersed type of settlement hamlets are scattered over a vast area. There is no specific plan and settlement unit is a single hamlet. The type of rural settlement is determined by number of factors. These factors may be grouped as follows: (i) physical, (ii) cultural, and (iii) historical.

Physical factors such as relief, altitude, drainage, depth of water-table, climate and soil, play an important role in determining the type and spacing of settlements. In dry regions, for example, water is the most important single factor. The houses are clustered around a source of water which is a well or a pond. In the desert region of Rajasthan the compactness of a settlement is largely determined by water supply.

Ethnic and cultural factors, such as tribal, caste or communal identity, are also important in determining the layout of a rural settlement. In India the main land-owning caste occupies the central part of the village and forms the nucleus. It attracts other caste groups (such as the potter, blacksmith and the weaver) who provide services to the village community. They occupy a specific place in the settlement plan. Harijan dwellings are generally situated on the periphery away from the main settlement. This shows social segregation. But it leads to

fragmentation of a compact settlement into several units.

Historical factors have also been an important influence on the type of rural settlements in India. Regions such as North Indian Plain which were exposed to frequent invasions from outside during which the swarms of armies inflicted terror, village communities preferred to live in compact settlements. This helped them a lot in defending against their enemies. A compact settlements also protects from internal enemies, particularly during periods of turmoil when villages were plundered by rival groups fighting for political power.

The tightly nucleated rural settlements are a common feature of the North Indian Plain from Punjab in the North-West to West Bengal. It is also a common type in Assam and Tripura, coastal Orissa, Mahanadi basin in Madhya Pradesh, Kaveri and Valgal basins of South India, Maldan district of Karnataka and Rayalaseema region of Andhra Pradesh. Obviously such a settlement type is a characteristic of a fertile, well-watered plain. In terms of shape it may be rectangular or even shapeless. The streets criss-cross at different angles forming *alis* and *galls*. The word *ali*, in use in Maharashtra, refers to a narrow lane which passes between the houses of the same caste facing each other. The *gali* on the other hand, is a wider lane which divides segments of two castes and serves as the thoroughfare. A compact or nucleated settlement often gets fragmented because of social segregation imposed by the caste system. Secondary settlement units are often known as *para*, *palli*, *nagla* or *diani*. The *para* is generally made up of houses of more than one caste. In eastern U.P. and Bihar as well as in Tamil Nadu and Karnataka hamlets inhabited by low castes are generally situated away from the main

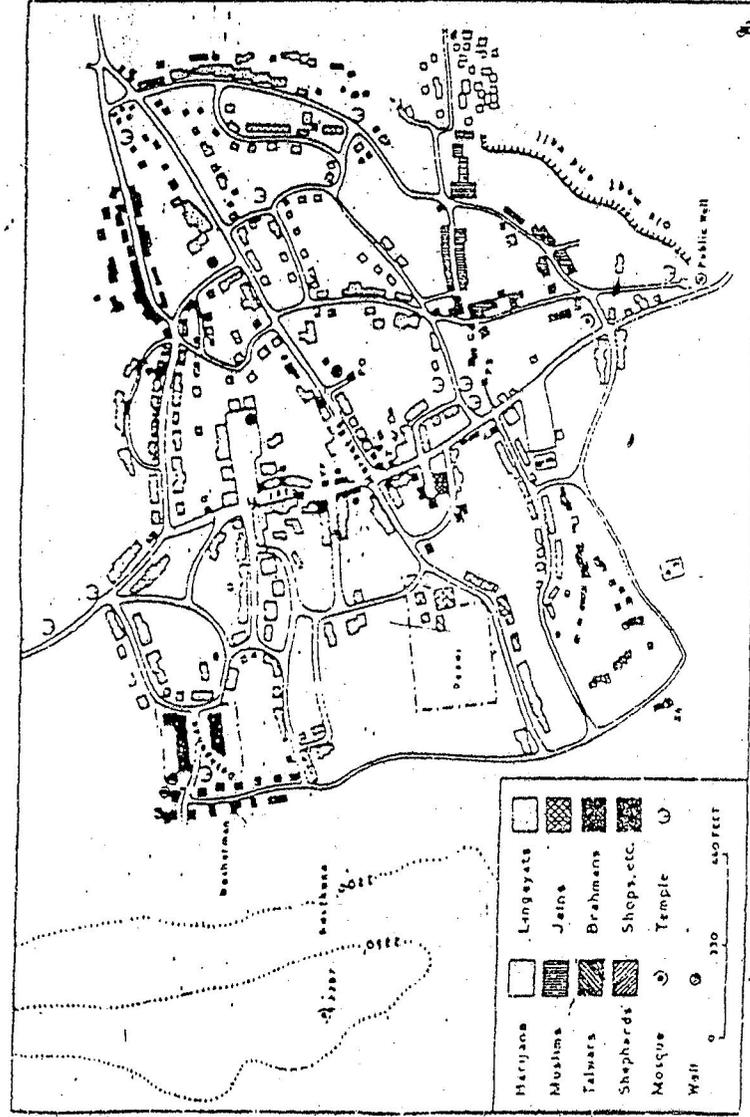


Fig. 32 A Village in Detail (Aminbhad, Deccan)
 S.—Boy; School; C.S.—Girls' School; U.S.—Urdu School; G.—Grocers Shop; B.—Banik shop; T.—Tea-Bidi Shop; P.O.—Post office; P.S.—Police station
 D.—Dispensary; Gt.—Government Grain Godown; VP.—Village Panchayat; M.—Lingayat Math; Sh.—Shikigera
 Courtesy: C.D. Dashpanda & D.H.K. Saha

nucleus of the village.

The general features of a nucleated settlement may be described by giving the example of Aminbhavi, a village in the Deccan plateau region, situated at a distance of about 10 kilometres to the north-east of Dharwar. Located in the black soil region, it represents the typical characteristics of an agricultural village in India. The morphology of the village has evolved over the last thirteen centuries or so. The houses belonging to different castes have a particular location within the settlement. Different caste groups occupy their own solid blocks of neighbouring houses in a lane carrying the name of the same caste. Lingayats are the main agricultural caste and account for some 40 per cent of the village population. Then there are Muslims, Desai (Jain) and Deshpande (Brahmin) families constitute the two culturally dominant groups. Talwars, Harjans and Wadars are the main service castes.

Lingayat houses are situated all over the village. Other caste groups occupy a specific position within the settlement. Low castes, such as Talwars and Harjans live on the fringe of the village.

The 'linear cluster' type of settlements have two parallel rows of houses facing each other across a wide village thoroughfare. These linear settlements are sometimes situated along a stream as in the case of Manipur, or in Balaghat, Mandla and Raigarh districts of Madhya Pradesh. Such linear settlements are predominantly inhabited by different tribal groups in the Chhotanagpur plateau. Linear settlements are also a common feature of Nagaland. The settlement is generally situated atop a high hill and is often fortified. The fishing villages in the coastal areas also look like linear settlements.

The dispersed settlement is a common feature of the undulating, hilly and the

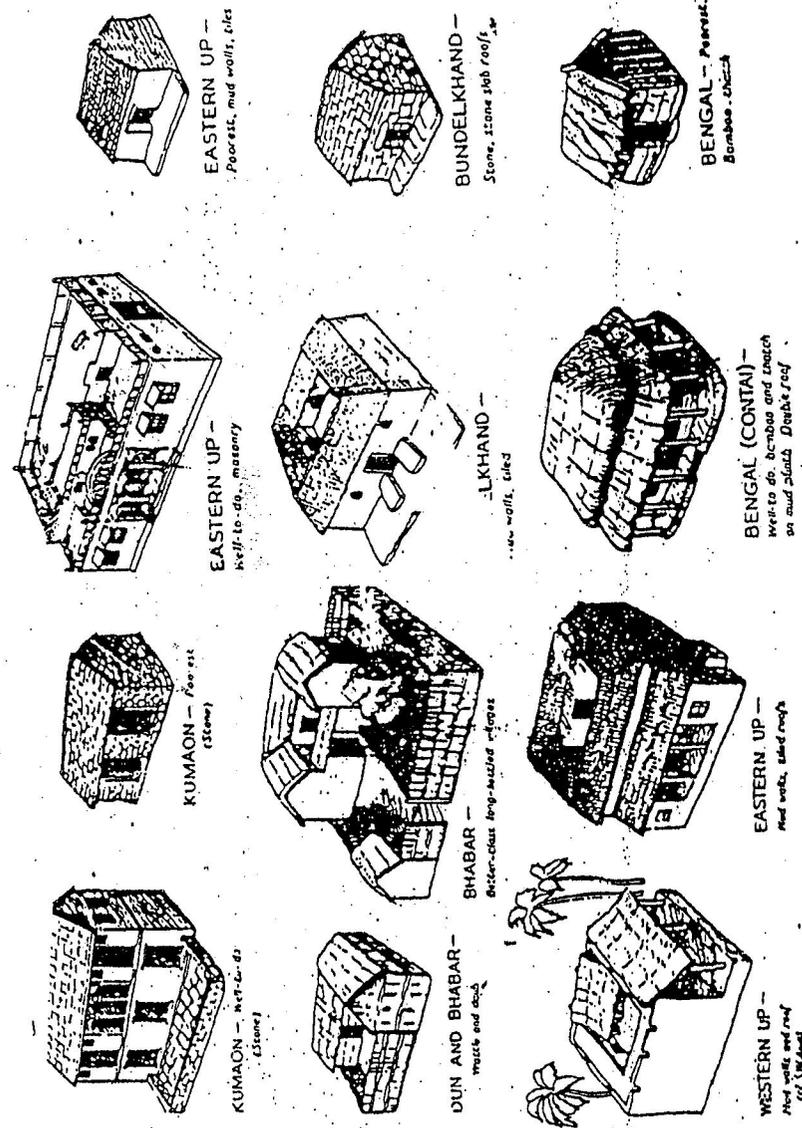
forested tracts of the country. Houses are generally placed on hillocks or knolls overlooking the fields along the hill slopes. This type of settlement is generally associated with the tribal communities in North Bengal, Chhotanagpur Plateau, parts of Madhya Pradesh and Rajasthan. The dispersed settlements are also found in the hilly districts of Jammu and Kashmir, Tamil Nadu and Kerala.

Sometimes a hamlet is a basic unit of a dispersed settlement type and generally consists of 2 to 5 or 8 huts. The households organise their labour on a cooperative basis to carry out agricultural operations and, therefore, live together. This type of settlement is generally found in Meghalaya and other hilly districts of the North-East, hilly districts of UP, Himachal Pradesh and parts of Chhotanagpur Plateau in Bihar, Orissa and Madhya Pradesh.

Settlement Patterns

The spatial organisation of houses in a village defines its pattern. As a matter of fact the street system within the settlement plays the most important role in defining the pattern. When houses are built in groups the street often plays the decisive role and the houses face not a particular direction but the village lane. Besides the street plan, other factors such as the location of a well or a pond or cultural elements such as temples and mosques give a peculiar pattern to the village. Rural settlements may acquire different pattern — radial-star shaped, check-board, circular, rectangular, hollow square or fan-shaped. A village acquires a radial-star patterns — when streets radiate from a common centre. Expansion of these villages due to population growth leads to the formation of a double radial pattern. Rectangular villages are a common feature in many parts of India. Other related forms are check-board plans, hollow rectangle or

Fig. 33 Some Indian House Types
(Courtesy: O.H.K. Spate, E. Ahmad & B. Mubertje)



square plans or L-shaped ones. When the houses cluster around a pond, villages often form a semi-circular or crescent-shaped pattern. There are other villages which have no compact nuclei. The huts are huddled together to form a settlement without forming any specific geometric shape.

Urban Settlements

We have noted in Chapter 8 that the Census of India recognises six size categories of towns and cities. Many of the smaller towns belonging to Class V and VI of the Census are simply 'grown-up' villages. They perform predominantly agricultural functions, collecting agricultural produce from the surrounding villages and marketing it. The *mandi* (grain market) forms the hub of the town. A market springs up along the road which provides access to the *mandi*. With the passage of time some local administrative functions were also assigned to the urban agglomeration and it acquired the characteristic features of a *tehsil* town.

Many towns continue to have administrative functions only. A town performing the role of a district headquarters is mainly an agglomeration of houses divided into separate blocks, or *mohallas*, laid out along two or more main streets. A network of lanes connects these *mohallas* with the main road. *Mandi* continues to be important and markets develop along the main roads. The district towns are generally uniform as they have a peculiar townscape. The British added a few administration buildings — a Collectorate, a Civil Court, a Kotwali, a PWD Office, a Dak Bungalow, and a Circuit House (in larger towns only).

The morphology of a town in India has its own distinguishing traits. There is hardly any difference between the residential and the commercial areas.

Traders prefer to live over the first floor level of their shops in the market place. The residential houses are located on the first floor while the shops or offices are located on the ground floor.

Artisans in these towns live in one or two *mohallas*. This adds an element of social segregation as many artisans belong to specific castes or communities. Segregation based on income levels is also a common feature of our towns. The municipal administration very often makes a distinction between the high income and the low income quarters in providing civic amenities. The residential locations of low income groups often degenerate into slums. Many Indian towns retain their original character so far as segregation based on caste and community is concerned.

The British added a number of new elements to the traditional townscapes. They developed separate areas for the settlement of the British officers. These were more open and well planned parts of the city with bungalows located in wide open lawns and gardens. These quarters came to be known as 'civil lines'. Cantonments and railway colonies were also added to these towns.

The old cities of Agra and Delhi are reminiscent of the medieval urban agglomerations. Some of the older towns of the Indian princely states, such as Jaipur, were planned on an elaborate basis with wide, open roads. The streets crossed each other at right angles. Jaipur used to be the best example of a planned Indian town.

Many urban places began as temple towns and their basic function was to cater to the needs of the pilgrims. Varanasi (formerly Banaras), Mathura and Madurai are the best examples.

The modern cities in India today, particularly the metropolitan centres such

as Calcutta, Mumbai, Delhi, Bangalore, Chennai (formerly Madras) and Hyderabad to name only a few, are a mix of the old and the new. Their modern elements evident in high income-group housing schemes, shopping centres (such as Connaught Place in Delhi and M.G. Road in Bangalore), fly-overs, sports stadia, golf courses, clubs and luxury hotels are as modern as any European city. But the interior parts of the city, such as Shahjehanabad in Delhi or the squatter colonies in Delhi, Calcutta, Mumbai and Chennai are as Indian in looks as any other old town. The distinction between the old and the new in an Indian city is not that easy.

House Types

The rural house in India is a type in itself. It grows from the soil. The building materials — mud, thatch, bamboo, pieces of stones, wood or unburnt bricks are locally procured. The house in its design or internal plan reflects the social or cultural values of the people. Development has brought about changes and houses made of burnt bricks, cement or concrete are now common sights in many affluent villages. But the traditional house still conforms to a type which has the stamp of the region in which it is situated.

Rural houses may belong to several types varying from a single room hut made of mud and with a thatched or tiled roof to houses with several rooms and elaborate plans and raised platforms at the entry point (Fig. 33). There are scores of varieties in between. These distinctions are based on several considerations:

- (i) climatic conditions are such that a courtyard is necessary in all parts of India;
- (ii) a peasant house should have separate space for storing agricultural produce and pens for

draught animals and dairy cattle;

- (iii) the walls and the roofs are made according to the weather conditions and with the help of locally available raw materials;
- (iv) cultural values very often play a role in determining the direction in which the houses open or their main entrance is situated. Domestic layout or the architecture often reveals ethnic connections, rituals and whims.

A distinguishing feature of the Indian house type is the courtyard (*angan* or *uthan*). It is universal. It is here that the family performs most of the activities. In fact, it is the main living space. Rooms are used for storing property, for privacy and for sleeping in winters. The courtyard has its varieties in the form of a porch or an overhanging verandah as an extension of the main house in the cold and wet highland regions of Jammu & Kashmir, Himachal Pradesh, UP, West Bengal, Sikkim, Arunachal Pradesh, Nagaland and other states in the North-East.

In regions where shifting cultivation is still practised and where the village economy is still dependent on collection from the forest, the common house type is a single-room hut. Its shape is generally rectangular. It has a single or double-slope roof, other huts have a round or circular shape and a conical roof. There is space for storing the grain, for the livestock and the kitchen inside the hut. The space in the front is used as the courtyard.

The North Indian Plain displays a variety in house-types. They have an elaborate courtyard surrounded by mud walls and rooms. Sometimes there is a common village courtyard enclosed by huts. The huts are very often laid out in two parallel rows facing each other across a common courtyard. In the fishing villages of Kerala, the courtyard is often open-

ended. An elaborate peasant house in UP, Haryana or Punjab may have one or several rooms on the first floor which overlook the courtyard. The double-storey house belongs to the richer families only.

If the household consists of two huts, they are usually placed at right angles to each other and enclosed by a fenced rectangular courtyard. This type is common in the peninsular region of India. The two-hut and courtyard arrangement undergoes a change. The two huts face each other and the courtyard encloses them on two sides. Such type is common in Kerala, Orissa, West Bengal, Assam, Tripura and Manipur. The impact of temple designs on the house types is

commonly observed in the southern states of India. Here houses have multiple courtyards.

It may be observed that despite the regional variations in domestic architecture and house types, the Indian house reflects the basic elements of the Indian civilization. These are expressed in our concept of the family and the kinship relations and our adherence to the religious faith. Agriculture very often is a way of life and the place of livestock in the day-to-day activities of the household adds common elements which cut across the regional boundaries. The Indian house type reveals both the diversity and the unity of our common Indian tradition.

EXERCISES

Review Questions

- Answer the following questions in brief:
 - What is the basic unit of residence?
 - What is a settlement?
 - Into how many categories can rural settlements be classified? Name them.
 - What kind of rural settlements predominate in the North Indian Plain?
 - What do we understand by the term 'settlement pattern'?
 - Which two components basically define a settlement pattern?
 - What is the most distinguishing feature of the Indian house type?
- Distinguish between:
 - Rural and urban settlements.
 - Clustered and dispersed rural settlements
 - 'All' and 'Gali'
- Describe briefly the types of rural settlements found in India.
- Discuss the factors that determine the type of rural settlements.
- Describe the various patterns of rural settlements commonly found in India.
- Discuss how the character of a settlement changes from rural to urban. Why many smaller towns in India are still considered 'grown-up' villages?
- "The house in its design or internal plan reflects the social and cultural values of our people". Elaborate with the help of suitable examples.

HUMAN SETTLEMENTS AND HOUSE TYPES

Project Work

- Collect information and photographs of rural settlements from the following regions:
 - the mountainous region.
 - the plains.
 Compare the two and prepare a note covering aspects of location, size, shape, important activities, house types and street plan.
- Draw sketches of major house types found in rural areas. Take one example each from the northern, north-eastern, eastern, central, western and southern parts of India. Write a note on the major features of the above house types and the possible reasons for the differences in their construction.

Unity in Diversity

THE SOCIAL ethos of India reflects a high degree of unity in diversity. The factors that have led to the emergence of this unique feature of the Indian polity are not far to seek. We shall examine the spatial aspects of this ethos, and the factors which operate as bonds of unity, on the other.

Factors of Diversity

First, the large geographical spread of the sub-continent provides fertile ground for the germination and flowering of regional diversities in the social milieu. India is the seventh largest country in the world, approximating in size with the continent of Europe minus the Commonwealth of Independent States (CIS). It would have been surprising indeed if the degree of regional differentiation in a country of such dimensions would have been less marked than what it is.

Second, the differentiation in the natural landscape has contributed to the emergence of different forms and patterns of human interaction with nature in the different regions of India. The regional dimensions of the natural phenomena have already been examined in the previous chapters of this book. Ranging from the senile topography of the Deccan to the youthful features of the Himalaya, from the highly differentiated system of the highest peaks of the world to the unvarying

monotony of the extensive plains, from the intricate maze of channels in the Bengal delta to the complete absence of surface-flow in the Thar, from the wettest parts of the world to some of the driest, from the dense growth of tropical forests in North-East to the vast extensive tracts in Rajasthan where not a blade of grass grows, the extent of diversity in the natural environment of India is of an astoundingly high order. The Indian people have, for millennia, interacted and come to terms with these different environments and, as a consequence, their responses to their specific landscapes have acquired distinctly regional forms. The food they eat, the clothes they wear, the houses they live in, the economic activities they carry out, the dialects they speak, the ballads they sing, the festivals they organise, myths and legends that embody their emotional responses all of these have a regional stamp. The transhumant Gujjar herdsmen in the Pir Panjal, the Moplah fishermen of the Kerala Coast, the Maratha peasants of the black cotton soil belt, the Jhum cultivators of the humid North-East, the steel workers of Chhattisgarh — all in their own way, have and are coming to terms with their specific ecosystems. The social ethos of India reflects this diversity of human interaction with nature.

Third, the differing sources of the

waves of immigration into the sub-continent from the surrounding territories in a process spread over millennia, the different routes of the dispersal of these waves into this vast land and the consequent concentration of diverse ethnic elements in different regions has created a social mosaic with distinct regional concentration—their ethnic distinctiveness merging with each other in the vast intervening tracts. Three important regional concentrations may be distinguished: (i) the south, with its long coast line permitting maritime links with peoples across the sea; (ii) the North-West, with convenient openings for peoples of the vast expanses of Central and West Asia across the Himalayan range at Khyber and Bolan; and (iii) the North-East, whose passes permitted the immigration of Mongoloid people into the valleys and the Himalayan territories which show an interlacing of northern and southern elements in differing magnitudes enmeshed with each other within this mountain world.

Fourth, the formation of regional identities of the agricultural communities in different regions at different points of time within a long range of about 3,000 years has contributed to the strengthening of the regional forms in the social sphere. This process of region formation has been further sharpened by the continuity of the historical tradition of an essentially agricultural society.

Underlying Unity

In the light of the above, the unique feature of the social geography of India, is not the extent of its plurality but the fact that social diversity has been based on and sustained by an underlying unity which has grown with time. The factors that have led to strengthening of this underlying unity of the social ethos in India may now be

examined.

First, in spite of the differences in the natural environment of the various regions, the monsoonal rhythm of the seasons provides a strong element of uniformity. The alternation of the dry and the wet seasons and the concentration of the life-giving rains in a few months in the year is, by and large, an all India phenomenon, even though the magnitude of the dryness of the dry season and the wetness of the wet season varies greatly from one part of the country to the other. The music and fragrance, produced by raindrops falling on the parched, thirsty earth generates intense emotional responses in the Indian people almost everywhere — from the arid Thar to the Humid North-East. The *Kajari* of Bhojpur and the *Malhar* of Braj have their counterparts in almost all parts of India. The rainfed, subsistence agriculture and the village community based on it was, in more than one sense, a gift of the monsoon. The all-persuasiveness of the monsoon in spite of many regional variations — has provided the natural base for a certain degree of uniformity in human interaction with nature throughout the length and breadth of the country; the unity of India is strongly rooted in this commonness.

Second, the horizontal spread of cultural and socio-economic attributes from different parts of the country to each other and the constant and ever-growing give-and-take through inter-regional contacts and exchanges has generated a process of cultural fusion which has put its stamp on regional cultures and has created strong bonds of unification and integration. The foremost of all of these integrative forces in the basal matrix of Indian culture was provided by the spatial spread of Vedic and Pauranic traditions during the ancient period itself from the Indo-Gangetic plains south, north, and

eastwards, bringing the whole area from Kashmir to Kanyakumari and from desert wastes of Sindh to the lush valleys of Kamrup under its influence. The unifying role of this horizontal spread became strong and meaningful to the extent it had the capacity to assimilate within itself elements of regional traditions and getting itself enriched and transformed in this process. This give-and-take operated at two levels. Firstly, Brahmanical learning through the medium of Sanskrit provided strong bonds of cultural unity among the religious and the intellectual elite in the country as a whole. A similar role was played by Persian and English in the later periods of history. Secondly, and perhaps, in a more important sense, it was the cultural fusion achieved through the preachings of *Bhakti* and *Sufi* saints in rural India which has left an indelible print on the cultural ethos of India. Though Kabir and Nanak, Tukaram and Chishli, Ramanuj and Nooruddin Rishi spoke in different dialects, their message was essentially the same — the message of the unity of humankind and the human brotherhood. Perhaps nowhere else in the world does one find such apparently diverse traditions as those associated with Hinduism and Islam getting intertwined so intricately into a composite matrix as reflected in the *Kabirbani*, the *Taj Mahal*, the *Rag Darbar* or the Kangra miniatures. The integration of India is strongly rooted in this composite matrix.

Third, the development of inter-regional linkages and the emergence of a national home market during the last two hundred years or so, though constrained by the negative influences of imperialist exploitation have played an important role in unifying the country. The British by striking at the roots of the self-sufficiency of the village community, brought the bulk of rural India into a largely unified all India

market. The establishment of a network of railways and other means of communication greatly facilitated this process. The requirements of the economy also generated inter-district and inter-state migrations on a considerable scale, breaking the age-old isolation of regional groups from each other. Of special significance in this connection was the rural-urban migrations stream which brought together into urban agglomerations, people who spoke different dialects or professed different faiths, but were citizens of an emergent India. The attempts made since 1947 to correct the distortions introduced by the British in the regional structure of the country and the accelerated rate of socio-economic development have furthered the consolidation of the national home market and have thus strengthened the foundations of Indian nationhood.

Major Elements of the Regional Structure

Let us have a closer look at the main elements of the regional structure of the Indian polity as it has evolved under the impact of the factors noted above. The physical layout of India is such that all regions are not equally suited for settled agriculture at the same level of technology. The differences in relief and in distribution of rainfall and the forests cover have resulted in some areas continuing to be centres of perennial attraction while others remaining more or less negative from this point of view.

The river basins provided the most attractive areas for the early peasant communities. These basins offered a strong base for agriculture rich soils, adequate water supply and easy accessibility through riverine routes. The basins of the principal rivers — the Indus, Ganga, Narmada, Tapi, Godavari, Krishna

and the Kaveri provided habitats for these communities for thousands of years; and these regions have shown a cultural continuity which has a parallel only in the valleys of the Huang He and the Chang Jiang in China. They have continued to be the perennial nuclear regions of India. On the periphery of these basins lay the relatively less attractive or relatively isolated areas as they were hilly, forested or dry and were away from the main lines of communication within the country. Sind, Mewar, Kathiawar, the upper Brahmaputra valley, coastal Orissa and Bundelkhand may be included in this category. There were other areas in the interior of the sub-continent or in the bordering mountain rim which were least attractive for agriculture or were isolated to a high degree. These isolated or negative regions have served as blind alleys in the history of the country. They have been characterised by a high degree of stagnation due to the persistence of earlier forms of culture largely unaffected by the winds of change which swept over the areas of perennial attraction. The Western Ghats, the Aravallis, the Vindhyan region of Central India, Chhotanagpur Plateau, hilly tracts of Orissa, Shillong Plateau and the bordering Assam hills belong to this category. These areas happen to coincide with the belts of tribal concentration in the country.

Elements of the Social Geography of India

The mosaic, revealed through the regional structure of the Indian polity as discussed above, also reflects the regional distribution of the social components of the Indian population and has been further strengthened by these distribution patterns. These processes and patterns have been analysed in some depth in the preceding chapters. It would, however, be

worthwhile to have an overview of the totality of these processes.

(a) Peopling of India

The peopling of India in the pre-historic, ancient and medieval periods has left a deep imprint on the ethnic characteristics of the different regions of the country. This is reflected in the concentration of the Palaeo-Mediterraneans in the South, of the Mediterraneans and the Nordics in the North, and the North-West, of Palaeo and Tibeto-Mongoloids in the Himalayan realm and the North-Eastern valleys, and of the Proto-Australoids in the Aravallis, the Vindhyas, and the Chhotanagpur region. The actual picture is far more complex but the recognition of these major tendencies of distribution are of some significance in understanding the regional structure of the country. It may, however, be noted that as we move from the geographical periphery towards the centre, ethnic distinctiveness loses much of its relevance since different categories merge with each other imperceptibly in the vast expanses of the Indian sub-continent through continuous contacts spread over thousands of years. There is a considerable weight in the assertion of Cohen when he states: "In summary and to push the data to its farthest conclusion, we might say that, even though historically and contemporaneously there is a tremendous diversity physically in India, there is, roughly speaking, a physical type which is Indian".

The ethnic characteristic of the population as a factor of regional differentiation in the social sphere is of particular relevance in the case of the tribal people. The Negrito communities have been by and large assimilated into other racial groups and the remnants are restricted now to parts of the Andaman Islands and the Nilgiri hills. The Proto-Australoid

communities have been squeezed into the agriculturally negative areas of the Aravalli-Vindhya-Chhotanagpur belt and are generally living at a low level of development. The Palaeo and the Tibeto-Mongoloid communities have lived in the small worlds within worlds of the mountain realm of the North and the North-East in relative isolation over centuries using low levels of technology in tropical forest ecosystems. These regional identities are being integrated in the democratic polity of India though inducing impulses of growth into them. Regional strains and stresses, that still persist, are the consequence of the differing levels of development as between the tribal and the adjacent non-tribal communities and the strains can be eliminated only by minimising such disparities.

(b) Caste

The most potent institution which in spite of its extremely negative role, continues to exert tremendous influence on social life in India is the caste system. While originally a distinctive trait of Hinduism, other religious groups like the Muslims, Sikhs and Christians, have been greatly influenced by it. It is said that as a result of conversion one may lose one's religion in India but not the caste. While the phenomenon of caste is all pervasive, it has its distinct regional forms. Indian Sociologist M.N. Srinivas has pointed out that while there is a horizontal unity in the higher castes of the sub-continent, each of them is also linked vertically with the lower castes in its own specific regional setting. Harrison has focused attention on this important feature of the caste system in the following words "The caste structure in India divides into a series of regional caste structures, all threaded loosely together within the all-embracing hierarchy of the Hindu society". The caste

system is a common feature in all parts of India; but it thrives on regional hosts. Of particular significance for the social geographer is the regional dimension of the distribution of the socially and economically deprived caste groups — for example, the Scheduled Castes in India. Their concentration reflects, in important ways, the incidence of poverty within the regional structure and indicates the varying magnitude and breadth of socio-economic exploitation in the different regions of India.

(c) Language

Language, the vehicle of communication, is perhaps the most important manifestation of the social cohesion of a group. Linguistic diversity in India, therefore, reflects regional differentiation, on the one hand, and is an important factor in region formation, on the other. The magnitude of linguistic diversity in the country has sometimes been over-stated. It may be noted that 97 per cent of the population of India communicates in 23 out of a total of 187 languages. The regional structure as reflected in the distribution of the major languages is hierarchical in nature with dialect regions nesting into sub-language regions, into language regions, into sub-family regions and finally into linguistic family regions. The basic units in the folk ethos is the dialect region which has persisted over long periods and has defied time. The intimate link between the spoken word and the territory is brought out effectively by the fact that the local dialects have been, since ancient times, designated by the geographic names of territories where they were spoken — for example, *Avanti*, *Prachaya*, *Suraseni*, and *Dakshinatyā* of the *Natyā Sastra* or *Bhojpur*, *Bundeli* and *Awadhi* of today. The persistence of this relationship over thousands of years is remarkable indeed

and has given it tremendous strength. As Vidyaiankar states: "The areas of Indian dialects and languages, as they are found today correspond in a striking manner with the ancient and medieval *Janapadas* and *Janpadasanghas*. They have grown out of the whole history of India". As we move above the dialect to the higher levels of the linguistic hierarchy, we once again meet the four-fold regional division: (i) the Dravidian region of the South, (ii) the Indo-Aryan region of the North and the North-West, (iii) the Mon-Khmer and the Tibeto-Myanmar (Burmese) region of the North-East and Himalayan realm, and (iv) the Austric region of the Aravalli-Vindhya-Chhotanagpur complex. While the fundamental role of language in regional differentiation in the social geography of India needs to be properly understood, it would be erroneous not to recognise the strong trend of inter-language cross-fertilization that has been spread over millennia and which has brought about, in the words of Katre, "a chemical fusion not a physical mixture where the different components can be easily separated. During the last three thousand years, each of these distinct groups of languages has come into close contact with the remaining groups, and out of this contact has arisen a vocabulary which shows a Pan-Indian characteristic."

(d) Religion

The religious composition of the population constitutes an important web in the social fabric of the country. India is the original home of Hinduism, which constitutes the system of beliefs and rituals for the great majority of its people. The horizontal spread of Hinduism from its cradle in the land of the *Sapta Sindhu* has brought the entire country under its influence. But, as M.N. Srinivas has rightly pointed out, a distinction need to be made between an

all India model of Hinduism and its regional variants. The folk ethos of rural India is so deeply rooted in diverse ecologies that religious ideas and values, in spite of an underlying unity, have acquired specific forms in regional moulds. The worship of the Mother Goddess, for example, which is the sheet-anchor of the religious beliefs of all agricultural peoples, is all pervasive; but *Kamakhya Devi* is specific to Kamrup, *Durga Devi* to Bengal, *Vatshino Devi* to the foothills in the North-West. It has in fact been suggested that a hierarchy ranging from village *mat* (mother) to deities of regional and all India significance — may be identified which proves the backbone of the regional structure of folk religion in India. Unlike Hinduism, whose distribution is widespread throughout the length and breadth of the country, the other religious communities have a marked tendency toward clustering and concentration. The Muslims against popular belief, are a predominantly rural community with marked concentration in the Kashmir Valley and the adjacent Kargil district, Mewat, Rohilkhand, and Upper Doab, Ganga Delta, Malabar, and the Lakshadweep. The Sikhs though extremely mobile are concentrated in the districts of Punjab and parts of Haryana. A great majority of the Christians live in the southern states of Kerala, Tamil Nadu and Goa and have their significant clusters in Chhotanagpur and the North-Eastern states. The tribal people have a strong affinity with animistic and totemistic beliefs.

It is undoubtedly true that religious beliefs constitute an important element in the spiritual life of the people, but the role of religious diversity in the Indian polity has quite often been overstated. Religious communities are intertwined with each other within the regional cultures. They do

not constitute separate national streams, confronting and interacting with each at the level of the nation. The Kashmiri Muslim and the Kashmiri Hindu have far more in common than either the Kashmiri Muslim and the Assamiya Muslim or the Kashmiri Hindu and the Tamil Hindu. The hearts of the Sikh, the Hindu and the Muslim peasants of the Punjab beat with the rhythm of the same *Bhangara* and the soft melody of the *Heer*. All the more remarkable in this process of cultural synthesis is the traditional role of fairs and festivals all over the land.

The Hindu shrines and holy places, the Islamic mosques and *dargahs*, the Jain *Teerthasthalas*, the Buddhist monasteries and the Christian churches, draw their devotees from many parts of India; some of them like Varanasi, Rameshwaram, Ajmer, Bodhi Gaya and Old Goa are shrines of national status; and they not only draw their devotees from all over India, but from our countrymen of other religions as well. These national and the regional shrines act as strong nodes for cultural and emotional integration of the nation in their economic functions, most of them, like the Pushkar Lake fair, serve to strengthen these bonds.

(e) Culture

An interesting balance between diversity and unity can be seen in most of our cultural expressions and art forms as well. The two classical systems of Carnatic and Hindustani music, though having a common aesthetic and technical base, have developed their own distinctive flavour and style. At the same time, there has been and continues to be a lot of exchange of *ragas*, melodies, techniques and styles between the two. At the popular level, though each region has its own distinct folk or tribal form of music, mutual influences are not rare. Forms or styles like *Lavani* or *Tura Kalagl* are found in

regions like Andhra Pradesh, Maharashtra and Rajasthan. There are popular ballads on heroic themes or folk tales and legends in different parts of the country with interesting similarities of motifs, styles and techniques. Some examples are — *Aha* of Bundelkhand, *Heer* of the Punjab, *Powada* of Maharashtra, and *Burrakatha* of Andhra. Almost all parts of the country have songs related to the rhythm of the seasons, like the *Kajari* of Bhojpur sung at the beat of the drizzling rain in Sawan or the *Holi* of Braj, expressing the gaiety and abundance of the harvest season. Many musical instruments like *Dhol*, *Maddal*, *Mridanga*, *Bansuri* and *Shahnai* are found in different regions with local variations in their names, shapes and in the manner of playing them.

In the sphere of the dance also, the classical systems of North, East and South like *Kathak*, *Odissi*, *Mantpur*, *Kuchipudi*, *Bharatanatyam* and *Kathakali* have in spite of a common heritage of aesthetic principles, evolved their own distinctive styles and flavour, frequently through interaction with the folk dances of their region, which are more closely integrated with the life of the people. Almost all the regions have dances relating to agricultural activity, seasonal cycles and associated festivals. What is interesting to note is that though the source of inspiration and the motifs are quite often the same, yet a distinct pattern of movement and choreography characterises the folk forms of each region.

The country has a magnificent variety of drama forms in different regions — both traditional and folk. Most of them carry forward some of the aesthetic principles laid down in the *Natya Sastra* and follow common or similar conventions. Their themes have their sources in the epics like *Ramayana* and *Mahabharata*. Particularly, the 12th century Sanskrit poem *Gret*

Govinda has given them a common tradition of total theatre consisting of music, song, dance, mime, lyrics and gesture. There are interesting instances of migration of forms and performers with consequent intermingling of various communities and groups, e.g., *Krishna Parvat* in the South is performed by Muslim performers; or, the singer-performers of Kathiawar have migrated to Andhra to perform a particular form of *Ramayana*. Dummy horse performances are common in Kachchh as well as in Tamil Nadu; or performance of narrative-dramatic verses based on scenes painted on larger cloth pieces or on paper are found in Rajasthan, Andhra Pradesh and Bengal. Such mingling of the common features and distinctive elements is a characteristic of other art forms also, like painting, sculpture, architecture, poetry, both in the sophisticated urban traditions as well as, in fact more pronouncedly, in the popular folk traditions of different regions. Indian 'culture' can be truly appreciated if we understand its unique composite character, in which the elements of diversity are as important as the common and unifying motifs, traditions and aesthetic sensibilities which have shaped them.

Centripetal and Centrifugal Forces

Thus it may be concluded that the social geography of India, over the centuries, has promoted a kind of healthy, mutually sustaining, relationship between diverse elements within the country. Viewed in the context of the preceding discussion, India can perhaps be best described as a unity in diversity. The historical process of give-and-take between the culturally diverse regions has resulted in the evolution of an all-India ethos, incorporating them beyond recognition. There have been episodes when the regional cultures have tended to assert their identity. This has happened

particularly in the peripheral and remote regions of India. During these episodes the regions have defied the forces of unification. There have been other episodes when the regional identities have been submerged under the tide of a powerful unifying force. In a sense our history is the history of a delicate balance between these forces. The emergence of the *Sodasa Mahajanpadas* by about the 6th century B.C. provides the basal stratum of the Indian regional structure. The building of the Magadhan Empire led to the development of inter-regional communication and the horizontal spread of centripetal tendencies. Kautilya described the whole land between the Himalaya and the sea as *Chakravarti Kshetra* or the emperor's realm. It may be noted that the *Samrat* or the *Chakravarti* did not disturb the regional entities but only superimposed the imperial sovereignty over them. The fall of the empire led to a period of political fragmentation and the resurgence of centrifugal forces. This period roughly between 700 and 1300 A.D. is sometimes considered to be a period of decay. This view overlooks the fact that regional cultures flourished and developed at a rapid rate during this epoch. As Subbarao has pointed out "..... the period from the 7th century after the Christian era has seen the rise and development of provincial languages and literatures, creative styles of temple architecture in the provinces of Gujarat, Orissa and Central India".

The coming in of the Pathans, Iranians and Central Asians during the medieval period accelerated the interplay between the centripetal and centrifugal trends and the unity in diversity of India emerged at a higher level of equilibrium. The Mughal *Suba*, *Sarkar* and the *Pargana*, for example, were, by and large, based on the hierarchy of regional identities as such a regional organization had evolved within the

environmental framework of India through time. The process of empire-building strengthened the centripetal tendencies to a very large extent. The British disrupted the indigenous regional structure to meet their own requirements of alien rule over the Indian people. It was done in the following way:

First, a port-oriented centrifugal transport network was imposed on India, which fragmented the home market and weakened the centripetal forces in the polity.

Secondly, the unnatural differentiation between princely states and the rest of the country was created and strengthened; and historically evolved regions were thus fragmented. The region of the Malayalam-speaking people was broken up into Malabar, a part incorporated in the province of Madras, and the rest annexed to the princely state of Travancore-Cochin.

Thirdly, unnatural "mixtures" were created which broke cultural identities and amalgamated parts of many cultural regions into the newly constituted unit. The princely state of Hyderabad, for example, was made up of slices from Maharashtra, Andhra and Karnataka. The British, thus, struck simultaneously against the centripetal and the centrifugal forces in the polity and against the healthy interplay between the two, which was the gift of both Indian geography and Indian history. Independent India, consequently, inherited

a fragmented regional structure. One of the primary challenges that had to be met effectively related to the correction of these regional distortions. The commitment to the liquidation of princely states and the reorganisation of states on a linguistic basis, met this challenge effectively. The present administrative map of India reflects the continuity of tradition. From the *Sodasa Mahajanpadas* of the 6th century B.C. to the linguistic states of our own times, is a historical continuum in geographically differentiated space.

Lesson of Social Geography

What is the lesson that a social geographer can learn from the Indian experience? Unity and diversity of India are not opposite categories which can grow at each other's cost. They are symbiotically linked together, support and sustain each other. Any attempt to over-emphasise either of these would disturb the delicate balance. Those who view India as a monolith and those who view it as a mechanical mixture of diverse elements put together by the British — are both wrong and do not understand one of the characteristic features of the Indian polity, that has made India what it is. They may appear to be contradictory on the surface but they both strike at the unity in diversity. This is the verdict of both geography and history; and we can ignore it only at great peril to ourselves and to the nation.

EXERCISES

Review Questions

1. Answer the following question in brief:

- (i) Define ecosystem.
- (ii) Mention the main factors leading to regional differentiation and diversities.
- (iii) How does the monsoonal rhythm of the seasons provide a strong element of uniformity in India?

- (iv) What is subsistence agriculture?
 - (v) What do you understand by the term "cultural fusion"? How did the Bhakti and Sufi saints influence the cultural fusion in India?
 - (vi) Cite two concrete examples of the inter-play between the Indian Geography and Indian History.
2. "The social ethos of India reflects a high degree of unity in diversity". Explain this statement with special reference to underlying unity.
 3. "The centripetal and centrifugal forces are producing a delicate balance of unity in diversity in the Indian polity". Elaborate this statement giving examples.
 4. "Unity in diversity of India are not opposites which grow at each other's cost. Instead they are symbiotically linked and support each other". How far do you agree with this statement? Give your arguments for and against it.

APPENDIX I

Population of States and Union Territories, 1991.

States	Population in 1991
1. Andhra Pradesh	66508008
2. Arunachal Pradesh	864558
3. Assam	22414322
4. Bihar	86374465
5. Goa	1169793
6. Gujarat	41309582
7. Haryana	16463648
8. Himachal Pradesh	5170877
9. Karnataka	44977201
10. Kerala	29098518
11. Madhya Pradesh	66181170
12. Maharashtra	78937187
13. Manipur	1837149
14. Meghalaya	1774788
15. Mizoram	680756
16. Nagaland	1209546
17. Orissa	31650736
18. Punjab	20281969
19. Rajasthan	44005990
20. Sikkim	406457
21. Tamil Nadu	55858946
22. Tripura	2757205
23. Uttar Pradesh	139112287
24. West Bengal	68077965
<i>Union Territories</i>	
25. Andaman & Nicobar Islands	280661
26. Chandigarh	642015
27. Dadra & Nagar Haveli	138477
28. Daman & Diu	101586
29. Delhi	9420644
30. Lakshadweep	51707
31. Pondicherry	807785
INDIA*	838583988

* Excluding Jammu & Kashmir

APPENDIX II

States Arranged in a Descending Order According to Population Size, Density and Population Growth

Ranking on Total Population	Ranking on Density	Ranking on Population Growth, 1981-91**
1. Uttar Pradesh	1. West Bengal	1. Nagaland
2. Bihar	2. Kerala	2. Mizoram
3. Maharashtra	3. Bihar	3. Arunachal Pradesh
4. West Bengal	4. Uttar Pradesh	4. Tripura
5. Andhra Pradesh	5. Tamil Nadu	5. Meghalaya
6. Madhya Pradesh	6. Punjab	6. Manipur
7. Tamil Nadu	7. Haryana	7. Sikkim
8. Karnataka	8. Goa	8. Rajasthan
9. Rajasthan	9. Assam	9. Haryana
10. Gujarat	10. Tripura	10. Madhya Pradesh
11. Orissa	11. Maharashtra	11. Maharashtra
12. Kerala	12. Andhra Pradesh	12. Uttar Pradesh
13. Assam	13. Karnataka	13. West Bengal
14. Punjab	14. Gujarat	14. Andhra Pradesh
15. Haryana	15. Orissa	15. Bihar
16. Himachal Pradesh	16. Madhya Pradesh	16. Gujarat
17. Tripura	17. Rajasthan	17. Karnataka
18. Manipur	18. Himachal Pradesh	18. Punjab
19. Meghalaya	19. Manipur	19. Himachal Pradesh
20. Nagaland	20. Meghalaya	20. Orissa
21. Goa	21. Nagaland	21. Goa
22. Arunachal Pradesh	22. Sikkim	22. Tamil Nadu
23. Mizoram	23. Mizoram	23. Kerala
24. Sikkim	24. Arunachal Pradesh	

* Jammu & Kashmir does not find a place here because 1991 Census was not held in the State

** Assam is not included since 1981 Census was not held there.

APPENDIX III
Rural-Urban Population, 1991

States	Total Population	Urban %	Rural %
Andhra Pradesh	66508008	26.89	73.11
Arunachal Pradesh	864558	12.80	87.20
Assam	22414322	11.10	88.90
Bihar	86374465	13.14	86.86
Goa	1169793	41.01	58.99
Gujarat	41309582	34.40	65.60
Haryana	16463648	24.63	75.37
Himachal Pradesh	5170877	8.69	91.31
Karnataka	44077201	30.92	69.08
Kerala	29008518	26.30	73.70
Madhya Pradesh	66181170	23.18	76.82
Maharashtra	78937187	38.69	61.31
Manipur	1837149	27.52	72.48
Meghalaya	1774788	18.60	81.40
Mizoram	689756	46.10	53.90
Nagaland	1209546	17.21	82.79
Orissa	31659736	13.38	86.62
Punjab	20281969	29.55	70.45
Rajasthan	44005990	22.88	77.12
Sikkim	406457	9.10	90.90
Tamil Nadu	55858946	34.15	65.85
Tripura	2757205	15.30	84.70
Uttar Pradesh	139112287	19.84	80.16
West Bengal	68077965	27.48	72.52
Union Territories			
Andaman & Nicobar Islands	280661	26.71	73.29
Chandigarh	642015	89.69	10.31
Dadra & Nagar Haveli	138477	8.47	91.53
Daman & Diu	101566	46.80	53.20
Delhi	9420644	89.93	10.07
Lakshadweep	51707	56.31	43.69
Pondicherry	807785	64.00	36.00
INDIA	838583988	26.13	73.87

* Excluding Jammu & Kashmir

APPENDIX IV (A)

Age Structure of Population India, 1991

All Groups (1)	Total Population (2)	% to All Ages (3)	Total Male (4)	% to All Ages (5)	Total Female (6)	% to All Ages (7)
All Ages	838567936	100.00	435208158	100.00	403359778	100.00
0-9	213672764	25.48	109779816	25.22	103892948	25.76
10-14	98691898	11.77	51947630	11.94	46744268	11.59
15-19	79034920	9.42	42231074	9.70	36803855	9.12
20-24	74472704	8.88	37514223	8.62	36958481	9.16
25-29	69239258	8.26	34546587	7.94	34692671	8.60
30-34	58404484	6.96	29917765	6.87	28486719	7.06
35-39	52398870	6.25	27558300	6.33	24840570	6.16
40-44	42556330	5.07	22842245	5.25	19714094	4.89
45-49	36133798	4.31	18954561	4.36	17179237	4.26
50-54	31113592	3.71	16004890	3.68	14208702	3.52
55-59	21472502	2.56	10941747	2.51	10530755	2.61
60-64	22748976	2.71	11907237	2.74	10841739	2.69
65-69	12858499	1.53	6493630	1.49	6364869	1.58
70-74	10554081	1.26	5535950	1.27	5018131	1.24
75-79	4145573	0.49	2192284	0.48	2043289	0.51
80+	6374511	0.76	3324624	0.76	3049887	0.76
Age not stated	4695158	0.56	2705595	0.62	1989563	0.49

Source : Census of India, 1991, Table C-1

APPENDIX IV (B)

Age Structure of Population by Selected Age Groups India, 1991

Age Group	Total (in %)	Male (in %)	Female (in %)
0-14	37.25	37.14	37.35
15-29	26.56	26.26	26.89
30-39	13.21	13.21	13.22
40-49	9.38	9.60	9.15
50-59	6.27	6.40	6.15
60+	6.76	6.75	6.77

Source : Census of India, 1991, Table C-1

APPENDIX V

Population of Scheduled Tribes, 1991

States	Total Population	Scheduled Tribe Population	% of Scheduled Tribe Population
Andhra Pradesh	66508008	4199481	6.31
Arunachal Pradesh	864558	550351	63.66
Assam	22413422	2874441	12.83
Bihar	86374465	6616914	7.66
Goa	1169793	396	0.03
Gujarat	41309582	6161775	14.92
Haryana	Nil	Nil	Nil
Himachal Pradesh	5170877	218349	4.22
Karnataka	44977201	1915691	4.26
Kerala	29098518	320967	1.10
Madhya Pradesh	66181170	15399034	23
Maharashtra	78937187	7318281	9.27
Manipur	1837149	632173	34.41
Meghalaya	1774788	1517927	85.53
Mizoram	689756	653565	94.75
Nagaland	1209546	1060822	87.70
Orissa	31659736	7032214	22.21
Punjab	20281969	Nil	Nil
Rajasthan	44005990	5474881	12.44
Sikkim	406457	90901	22.36
Tamil Nadu	55858946	574194	1.03
Tripura	2757205	853345	30.95
Uttar Pradesh	139112287	287901	0.21
West Bengal	68077965	3808760	5.60
Union Territories			
Andaman & Nicobar Islands	280361	26770	9.54
Chandigarh	642015	Nil	Nil
Dadra & Nagar Haveli	138477	109380	78.99
Daman & Diu	101586	11724	11.54
Delhi	9420644	Nil	Nil
Lakshadweep	51707	48163	93.15
Pondichery	807785	Nil	Nil
INDIA*	838583988	67758380	8.08

* Excluding Jammu & Kashmir

APPENDIX VI

Population of Scheduled Castes, 1991

States	Total Population	Scheduled Caste Population	% of Scheduled Caste Population
Andhra Pradesh	66508008	10592066	15.93
Arunachal Pradesh	864558	4052	0.47
Assam	22413422	1659412	7.40
Bihar	86374465	12571700	14.56
Goa	1169793	24364	2.08
Gujarat	41309582	3060358	7.41
Haryana	16463048	3250933	19.75
Himachal Pradesh	5170877	1310296	25.34
Karnataka	44977201	7369279	16.38
Kerala	29098518	2886522	9.92
Madhya Pradesh	66181170	9626679	14.54
Maharashtra	78937187	8757842	11.10
Manipur	1837149	37105	2.02
Meghalaya	1774788	9072	0.51
Mizoram	689756	691	0.10
Nagaland	1209546	Nil	Nil
Orissa	31659736	5129314	16.20
Punjab	20281969	5742528	28.31
Rajasthan	44005990	7607820	17.29
Sikkim	406457	24084	5.93
Tamil Nadu	55858946	10712266	19.18
Tripura	2757205	451116	16.36
Uttar Pradesh	139112287	29776455	21.04
West Bengal	68077965	16080611	23.62
Union Territories			
Andaman & Nicobar Islands	280361	Nil	Nil
Chandigarh	642015	105977	16.51
Dadra & Nagar Haveli	138477	2730	1.97
Daman & Diu	101586	3891	3.83
Delhi	9420644	1794836	19.05
Lakshadweep	51707	Nil	Nil
Pondichery	807785	131278	16.25
INDIA*	838583988	138223277	16.54

* Excluding Jammu & Kashmir

APPENDIX VII

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