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MODERN ECONOMIC GEOGRAPHY . . .

[INDIA AND PAKISTAN]

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PREFACE TO THE FIRST EDITION

With the division of India and the attainment of independence the political background for the study of Economic Geography of the two new-born countries *India* and *Pakistan* completely changed on 15th August, 1947. The necessity of a new book on the subject became imperative. In this book I have tried to meet this exigency. I have put in up-to-the-minute information regarding various development schemes, and have discussed the effect of partition on various raw material resources, industries and trade. Lack of reliable statistics has been my greatest difficulty but I have spared no pains to hunt out statistical informations from various resources and compared them carefully before putting them down. A special feature of the book is its illustrations, including various new schemes and developments. I must thank the Editor of the Statesman for allowing me to use some maps published in the paper.

Calcutta
20th September 1948.

S. C. BOSE.

PREFACE TO THE SECOND EDITION

It is now felt that the need for comparing India and Pakistan in every economic sphere does not exist any more. So I have separated out facts about Pakistan and dealt with them exhaustively at the end in a new chapter, using statistics from recent Pakistan Government publications.

Chapters on India have been thoroughly revised and much new statistics has been added, specially in the chapters dealing with industry and foreign trade. Many new maps and graphs have been added.

I hope that the book in its new form will be as helpful as its predecessor.

62, Lake Place,
Calcutta—29,
15th December, 1950.

S. C. BOSE.

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INTRODUCTION

Economic Geography deals firstly with man and his environment, and secondly with the wants of man and how he satisfies them from his environment. To fully appreciate the elements of the economic geography of a country, therefore, one must study the environment, that is the physical geography of the country. The next step will be to study the products, raw or fabricated, manufactured or semi-manufactured, produced in the country. They will depend upon the physical geography of the land directly or indirectly. Even the activities of man to procure them, and to move them from place to place for their equitable distribution are controlled by geographical facts.

The physical geography of a country includes:—

(a) *Physiography,* which consists of a description of (i) mountains, (ii) plateaus, (iii) plains, (iv) river systems, (v) lakes and (vi) deserts.

(b) *Geology,* specially that part of it which directly affects man, namely (i) influence of geology on land-form development and (ii) mineral geology.

(c) *Climate,* and weather types.

(d) *Natural vegetation,* which is a result of the interaction of climate and physiography, together with the position of the country on the globe.

(e) *Soils,* which are the products of the action of climate and vegetation on the bed rock.

To understand the economic geography of India, and to have a firm base of this knowledge, one must know conditions in India regarding the five heads given above.

After this knowledge is acquired one is in a position to proceed to find out the produce of the land resulting from man's attempts to satisfy his needs. It should be noted that his needs and his producing capacity are determined by:

(a) the degree of civilization he has reached,
(b) the stage of development of the land,
(c) the physical geography of the land.

The products of the land may be divided into the following heads:—

(i) Forest products,
(ii) Mineral products,
(iii) Animal products,
(iv) Marine products,
(v) Agricultural products.

The next step in the economic geography of a country is the attempt of man to fabricate these raw materials into goods directly needed by him. This leads one to the study of *industry*.

Lastly arises the need for *commerce,* which is required for the equitable distribution of commodities raw or manufactured. This includes:

(a) Ways and means of transport which includes a study of (i) land routes consisting of railways, roads, tracks, navigable waterways and mountain passes; (ii) Sea routes, ports and ship canals; (iii) Airways and airfields; (iv) Vehicles used in transport on land, sea and air.

(b) A description of the actual quantitative movement of commodities from one country to the other, that is trade, is the final result.

The following chapters deal with the above heads.

MODERN ECONOMIC GEOGRAPHY

INDIA

CHAPTER—I

PHYSICAL FEATURES

A glance at the physical map of India, only showing various altitudinal zones by tints (map-1) brings out the three main physical regions of India, namely:

(a) *The northern mountain wall,*
(b) *The middle alluvial plains, and*
(c) *The southern plateau.*

The adaptation of man to these three distinct types of regions brings out the essential features of their economic and commercial activities. Incidentally the Pakistan Territory has been carved out of the first two of these regions.

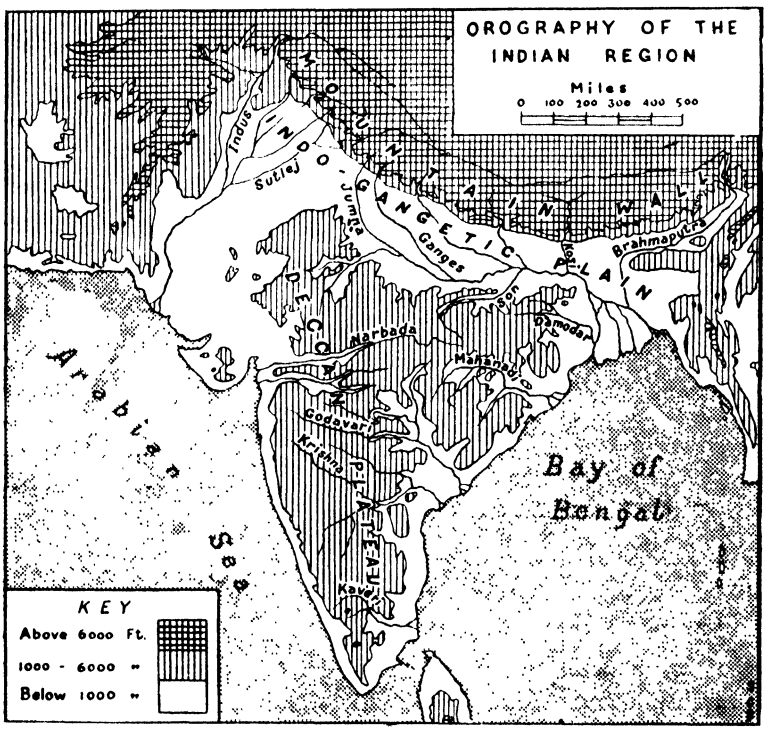
The Northern Mountain Wall

India and Pakistan are separated from the rest of Asia by a gigantic mountain wall. It makes both these countries a single natural unit, economically, culturally and even climatically, for the mountain wall is so high, and passes through it so few that only a limited amount of trade can be carried out by India and Pakistan with the neighbouring lands of Burma, Tibet, Afghanistan and Iran by land routes.

On the other hand there are no natural barriers along the Indo-Pakistan Border and trade between the two countries could flow unchecked if artificial customs barriers were removed.

There is but little cultural contact with Burma, Tibet, Afghanistan and Iran, owing to the intervening mountains, while many nationals of India have the same culture as their brethren in Pakistan and vice versa.

The economy of the two countries was developed on a common basis, without ever dreaming of separation. The physical unity of the two countries, hills and plains extending across the borders, river basins cutting across the artificial boundary line and so forth, reflected in road and railway systems being disrupted by the separation. Perhaps the worst consequence was the right to



Map 1

control river water, which has produced new problems in the canal systems of the two Punjabs.

The high mountains nearly cut off any connection between the air masses north and south of them. So India and Pakistan have a climatic unity. The intense low depression which forms in June in Western Pakistan brings rain to the whole of India. No artificial boundaries can stop this climatic unity.

The mountain wall can be divided into two sections:

(a) The Central Arc

It extends from *Namcha Barwa,* 25,445 feet high peak in the east round which river Brahmaputra swings to enter Assam, to *Nanga Parbat,* 26,529 feet giant in the west in Kashmir, round which the Indus swings to enter Swat in Pakistan. The arc is convex towards India, i.e., it bulges southwards. In between, it contains the great snow covered masses of Kinchinjunga (Kanchan Jangha), Everest, Dhaulagiri, Nanda Devi and Kailash. But passes are more important to a student of commercial geography than peaks. The central arc contains some famous passes, but unfortunately they are very high and difficult to climb, and snow bound for the major part of the year. No wheeled traffic is possible across them. Goods are carried by mules and yaks, and even hay needed for the pack animals has to be carried.

Jelep La (pass) and *Nathu La* north of Gangtok in Sikkim lead to Lhasa. Over them come wool, salt, gold and musk. The same products come to Simla from the Manasarowar region through *Shipki* down the Sutlej valley.

In Kashmir high passes have to be passed to go over to the Indus Valley. From the rail head at Jogindarnagar in Kulu, a road leads to Manali, from where a mule track crosses the *Rohtang* and *Bara Lacha Pass* over 16,000 feet high to Leh on the Indus. From here the route goes up the Nubra valley and across the Karakoram Pass to Sinkiang. Another route goes north from Srinagar and Sonamarg over *Zoji La* (*Pass*) 11,000 feet high to Leh. Yet another route goes north from Srinagar to Bandipur and then over *Burzil Pass* (over 13,000 feet) to Gilgit, from where routes lead to the Pamirs.

(b) The Eastern Wall

The mountain chains at the eastern end of the Central Arc suddenly change their direction towards the south. They consist of Patkai, Naga, Lushai and Chin Hills, with a western off-shoot in the Assam Plateau (Garo, Khasi and Jaintia Hills).

These hills are from six to four thousand feet high, and do not offer the great hindrance seen in the Central arc. They are however covered with deep forest—a result of very heavy rainfall, and are infested with head hunting tribes like Nagas. These difficul-

ties were however easily over-come during the second world war, firstly when millions of refugees from Burma crossed them, and secondly when the Anglo-American Armies struck back.

From the railhead at Ledo in the Upper Brahmaputra Valley was built the famous *Burma Road,* going over the 6,000 feet high Patkai Hills into Hukawng Valley and then to Myitkyina and Lashio in Burma, and to China beyond. This famous road was abandoned after the war.

An easier route starts from Dimapur on the Assam railway to Kohima, *Manipur* and Tamu on the Burmese border. From here it leads to Ye-u railhead and Mandalay. If a road and railway is built in future to improve connections with Burma, this route will be the most suitable. For it will connect Assam with Central Burma, which is rich in minerals. There is much scope for an overland trade to develop along this route. Manipur Plateau will form an excellent midway halting station on it.

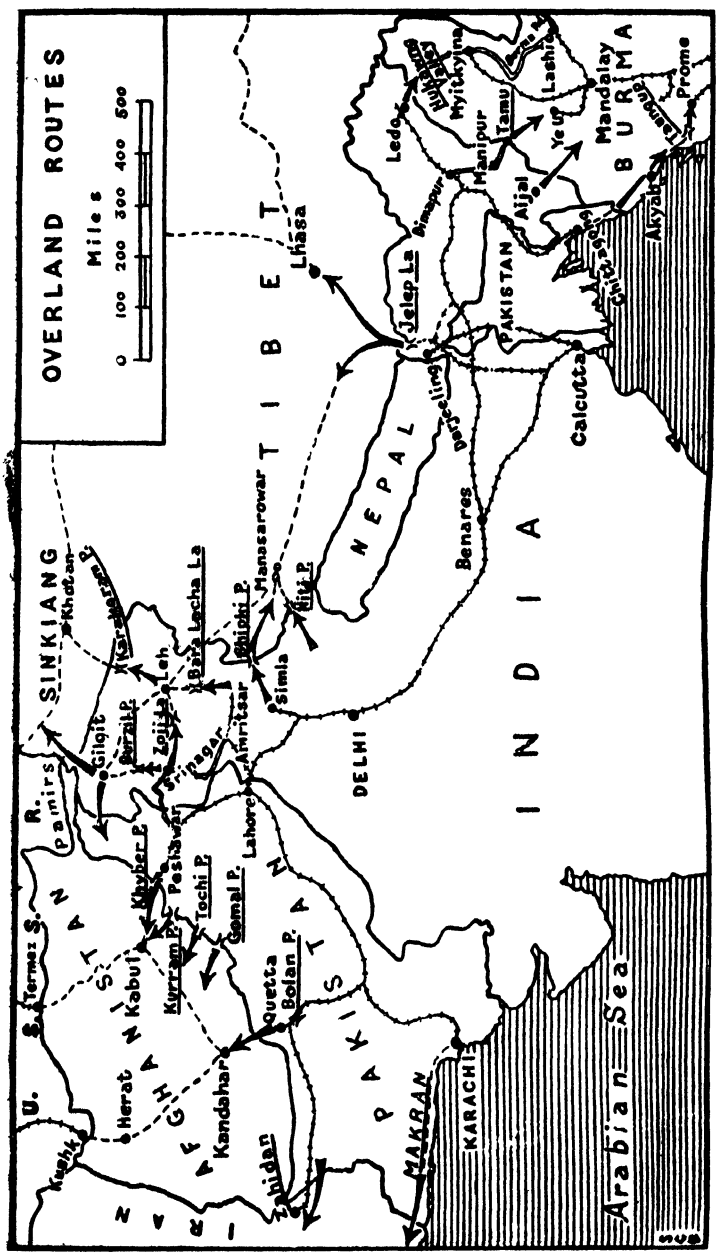
The third route starts from *Aijal* in Lushai Hills to Falam across the border and then to Pakokku on the Chindwin.

Resources of the Northern Mountain Wall

The most important resource of the Northern mountain Wall, specially the Central Arc is the mass of snow and ice accumulated in this region, and serving as a great water reservoir for the rivers of India. Ice having a latent heat equal to 80, cannot melt all of a sudden and serves the rivers best in the spring and early summer. The perennial flow in the Himalayan rivers maintained by the snow melt will also help in the production of hydro-electric power as projects, like those of the Kosi dam at Chatra Gorge, are completed. The steep gradient of the mountain, and heavy rainfall will also help in the matter.

Due to extremely rough topography and dense forest cover, it will take some time to unravel the mineral wealth of the Himalayas. Perhaps metallic veins are deep-seated, and erosion has not yet exposed them fully. But mineral oil exists all along the foothills and specially in the two flanks. Oil fields are worked in Assam. Existence of oil has been proved in the foothills of Cachar and Tripura. Coal and copper also exist and are worked.

Conditions of agriculture are difficult in the mountains, but tea growing in the eastern parts is an exception. Fruits are ex-


OVERLAND ROUTES
Miles
0 100 200 300 400 500
SINKIANG
TIBET
INDIA
NEPAL
PAKISTAN
BURMA
AFGHANISTAN
U.S.S.R.
Arabian Sea
Lhasa
Gilgit
Srinagar
Amritsar
Simla
Delhi
Lahore
Peshawar
Kabul
Herat
Kandahar
Quetta
Karachi
Makran
Zahidan
Hansarowar
Benares
Calcutta
Ledo
Manipur
Aijal
Mandalay
Akyab
Jelep La
Nathu La
Khyber P.
Gomal P.
Tochi P.
Kurram P.
Bolan P.
Khunjerab P.
Kara Koram P.
Zoji La
Bara Lacha La
Shipki P.
Niti P.
Pamirs
Termez
Khotan
Yatung
Phari
Gyantse
Shigatse
Phari P.
Lashio
Myitkyina
Tamu
Yenangyaung
Prome

Map 2

ported from Kashmir, and more orchards could easily be grown by enterprising farmers. Himachal Pradesh is already planning a 'grow more fruit' drive. There are numerous orchards in Kumaon Hills.

Alpine pastures on higher slopes above the tree line provide food for migratory herds of cattle and sheep with their shepherds.

There is an immense untapped wealth of forests in the Himalayas. Only a very small fraction of it is being exploited. Soft pine wood could be used for making pulp for paper, rayon and plastic goods.

The Central Plains

The plains consist of the Indus-Sutlej valley in the west, (half of which has gone to Pakistan) and the Ganges-Brahmaputra-Surma valley in the centre and east (a portion from the east is included in Pakistan).

Here emphasis is laid on agriculture, which is very intensive and supports dense population. The level topography has led to the development of roads and railways, and growth of big towns —industrial, cultural and religious. Forests have been cut down and replaced by agricultural land. Very large numbers of cattle, goats and sheep are kept, but lack of pasture makes them unhealthy, and unproductive. The mineral wealth lies hidden underneath a thick blanket of alluvium, and cannot be tapped. Only some saline soils yield some salts.

Lower portions of the rivers are navigable, which becomes the most important means of communication in the two Bengals.

The Indus and its five tributaries Sutlej, Beas, Ravi, Chenab and Jhelum water the plains of the two Punjabs. The border runs along the Ravi and then along the Sutlej. The rivers give rise to a net work of canals which has been cut across by the boundary.

The Ganges joins the Jamuna its main tributary near Allahabad. Its important tributaries from the north are Alaknanda, Ramganga, Gomati, Ghaggar, Gandak, Kosi and Mahananda. Chambal, Betwa, Ken and Son join the system from the south. Just after entering West Bengal the Ganges breaks into Bhagirathi and Padma. The former receives Mor, Ajay, Damodar and Rupnarayan from the west. The Padma is joined by Brahma-

putra, its branch Jamuna and Meghna in E. Bengal. Sankosh, Raidak and Tista are important tributaries of Brahmaputra.

Mention must be made of the Gangetic delta which lies between Padma-Meghna and Bhagirathi-Hooghly. It is traversed by numerous distributaries, some of them dying, others big and powerful, while all developing into salt water creeks of immense breadth as they approach the sea. The western distributaries are shrinking rapidly such as Jalangi, Mathabhanga and Bhairab. The eastern distributaries are powerful such as Madhumati-Gorai, Kumar and Arial-khan. While the upper portion of the delta is an agricultural expanse, the southern fringes are clothed by deep jungles called Sundarbans.

The Plateau

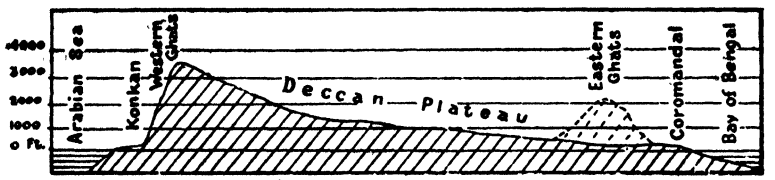
All of India lying south of the Vindhya Hill range extending up to Rajmahal Hills may be included in the great block of Deccan Plateau. This is a portion of the earth's primeval crust formed of a complex mass of crystalline rocks, welded into a very stable block. Erosion has considerably levelled up the plateau and the rugged Himalayan scenery of towering snow covered peaks, and rushing torrents in deep gorges is absent. Rolling landscape is most common. Forest cover is found in the rugged parts of the plateau where rainfall is enough. But though the forest is not so dense and widespread as in the Himalayan foot-hills it is more useful to man, for it has an open character and consists chiefly of useful deciduous trees, of which *Sal* is the most common.

While the plateau region has rich forest resources, it is more important for its mineral products. Being old in geological age, it has been rubbed down to its very roots, and the veins rich in minerals such as gold and mica have been exposed. Climate and old age together has resulted in the enrichment of the upper crust by iron and aluminium, rich deposits of whose ores, such as haemetite and bauxite occur extensively. Coal deposits are found in Gondwana sedimentaries, deposited in the geological age of the same name in lakes which existed at that time. Absence of earthquakes, severe folding or extensive faulting due to the stability of the plateau is responsible for the undisturbed condition of the coal seams, which is so necessary for favourable mining conditions.

In agriculture the plateau holds a position midway between

the Central plains and the Mountain wall. The residual soil is generally poor and soil erosion is very common. Large tracts in Central Deccan have a low rainfall. Digging of canals is expensive, and rivers are dry in late winter and early summer.

The hills and valleys of the Deccan Plateau do not offer insuperable obstacles to roads and railways like the Northern Mountain Wall. So a network of roads and railways has been gradually built though it is not so dense as in the Central Plains.



Map 3
Section across the Deccan Plateau.

The Deccan Plateau is a tilted block, the Western Ghats forming its upraised edge. Thus the Ghats rise abruptly from very near the western sea coast to a level of 3 to 5 thousand feet, but do not descend on the other side, gradually sloping down all the way to the Bay of Bengal. A number of gaps in the Western ghats are utilised by railways and roads. Of them Pal Ghat to the south is the lowest. Through it the railway goes to Mangalore and Ernakulam. Railways through the other two gaps, Thal Ghat and Bhor Ghat converge on Bombay.

The Plateau tapers southwards and reaches its highest point in Dodabetta peak, 8,760 feet high near Ootacamund in the Nilgiri Hills. Beyond Pal Ghat gap the plateau continues as the Anaimalai, Palni and Cardamom Hills, the last one reaching Cape Comorin.

Except Narbada and Tapti at the northern edge of the plateau the great rivers of the south, Mahanadi, Godavari, Krishna and Kaveri, flow from west to east, down the tilted block. In between their broad basins lie swells of land. Such is the Balaghat Hills between Krishna and Godavari, and Ajanta Range between the latter and Tapti.

North of Narbada lies the Vindya-Kaimur-Rajmahal line of hills, stretching from Gujerat to West Bengal. But though great

in length, it is low in height, and is not at all a significant physiographic feature. It offers no obstacle to roads or railways. The line of hills between Narbada and Tapti namely Satpura-Mahadeo-Maikal, is a higher and more rugged range.

The eastern edge of the plateau is broken into a number of isolated blocks by river basins mentioned above. The northernmost is the Chotanagpur Plateau lying between Ganges and Mahanadi. Between the later and Godavari lie the hills of Bastar and Orissa. South of Krishna they continue as Nallamalai Range. Together they are sometimes termed as Eastern Ghats. They offer no obstacle to communications.

Natural Regions of India

The three physiographic regions described above with their economic resources and commercial development, are also identical with the three main natural divisions of India. They may be further subdivided, for a more comprehensive study of the natural regions of India, as follows:—

Ladakh: This region forms the north-eastern part of Kashmir. It is a part of the bleak, cold Tibetan Plateau lying above 10,000 feet. In its rolling plains and low snowy ranges, it completely differs form the Himalayan scenery. Leh is a route centre in the Upper Indus valley. The culture of this region is similar to the Tibetan Buddhist culture. It is perhaps rich in minerals, but being inaccessible it will be difficult to extract them. The only production of this region is some wool.

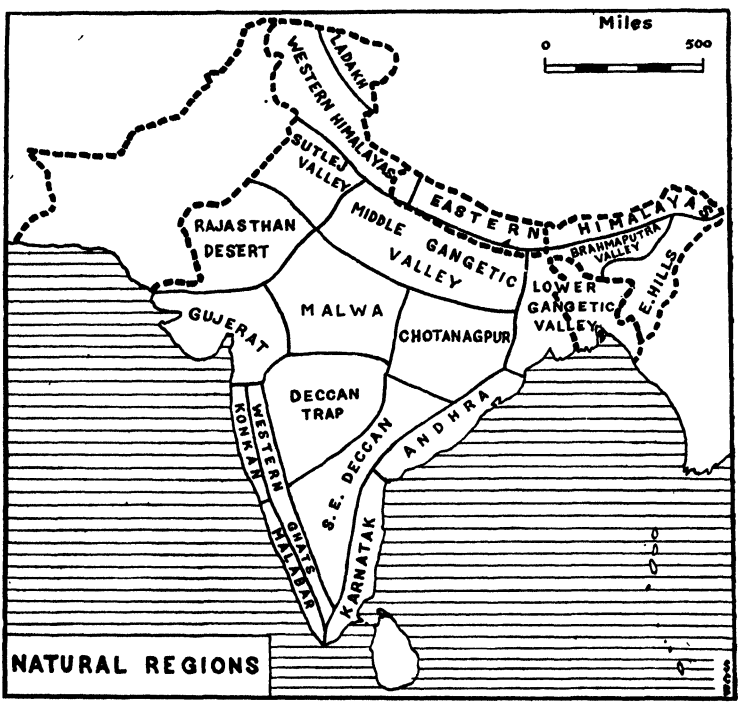
The Western Himalayas: This is the portion of Himalayas west of Nepal. It differs from Eastern Himalayas in its drier and colder climate. It also broadens out into a number of chains. The forest type and vegetation zones are also slightly different. Chir pine grows here extensively and can become a great source of soft wood and turpentine oil. All over this region temperate fruits grow. Peaches, plums, pears and apricots grow in its eastern parts, specially in Kumaon Hills. Apples, pears, walnuts and almonds are grown in the Kashmir valley. Timber and wool are two other leading products of this region.

The Eastern Himalayas: Rainfall here is heavy and so it is clothed with dense vegetation. Timber and various forest products are obtained. The rainfall assists the growth of tea

gardens clothing this reigon. Oranges grow in the warm valley bottoms.

Eastern Hills: These consist of hill ranges along the eastern borders of India and Meghalaya or Shillong plateau. The rainfall here is the heaviest in India and so these regions are densely forested. Pineapples and oranges grow in the valleys. There is great forest wealth and this area is a leading source of timber. Mineral oil is found in many places. Some coal is also mined.

The Sutlej Valley: It is the eastern part of the middle



Map 4

Indus basin. It is drained mainly by the Sutlej and its tributaries. Rainfall is insufficient for agriculture and irrigation is needed. In the irrigated areas wheat and cotton are grown. Since the partition of the country more land is coming under long staple cotton. The completion of Bhakra project will bring more land under irrigation. Millets are grown in unirrigated parts. There

are no minerals. Soil erosion is an increasing menace in the foot-hills. Afforestation can alone save these fastly deteriorating lands.

The Middle Gangetic Valley: It consists of the plains of Uttar Pradesh and North Bihar. It is drier and cooler than the lower valley, but hotter in summer. It is drained by the Ganges and its tributaries, the northern ones being snowfed. Much land is irrigated and further irrigation is possible. Some new land is being reclaimed. Cultivation is the main activity. Wheat and some rice are grown. Millets and barley are also grown. Sugarcane is grown extensively and provides cane for the sugar industry. There are no minerals and practically no forest products. Population is dense and there are many large cities.

The Lower Gangetic Valley: Heavy rainfall, abundance of rivers and nearness to sea gives it a new character. India's biggest port Calcutta is situated here. Rice and Jute are the chief crops. Uncultivated lands are often covered by bamboo clumps, which are now providing pulp for paper industry. The whole area is advanced industrially. The coal in the Damodar valley and the port of Calcutta are two factors which have helped in the rise of industry.

Brahmaputra Valley: This valley lies in the extreme north east of India between the Himalayas and the Meghalaya. A very large portion of it is forested. Rice is the main food crop. Jute cultivation is increasing. Oranges, pineapples and tea are other important products of export. India's large oil field-Digboi lies here. The valley is sparsely populated. There is much potential hydro-electric power. There is a great future for the valley. As it develops it will be able to support a denser population.

The Rajasthan Desert: This is a waste of sand and dry hills. Cultivation is sparse. But minerals are obtained including the famous marble of Udaipur and Jaipur and the salt deposits of Sambhar Lake. Mica is also found. Copper, lead and Zinc have been found, but have yet to be exploited. Attempts are being made to locate reserves of underground water, some being found in Jaipur. Millets are chiefly grown. Domestic animals are kept in pastures, where cultivation is not possible.

Gujerat: This forms the north-western corner of the Deccan Plateau. Rainfall is moderate. There are no important rivers

from which irrigation water could be had. The northern and eastern portions merge into the desert. Mixed farming is practised. Cotton is an important crop and has led to cotton textile industry. Chemical industry has also developed. The new port of Kandla will further help in industrializing this region.

Malwa: This is the central part of India. It consists of a rolling plateau just south of Rajasthan. Rainfall is medium. Temperatures are extreme. Wheat, Jowar and cotton are important crops. Domestic animals are kept. Availability of lime and clay has lead to cement industry. Much area is forested, specially the hilly regions. Timber is produced.

Chotanagpur: This is the north-eastern horn of the Deccan Plateau. With more rainfall, it is largely covered by forests. Sal forests are specially important, yielding good timber. But deforestation has led to soil erosion. Rivers are flooded during rains, but dry up in summer. Damodar and Mahanadi projects will control the rivers, produce power and supply water for irrigation. Rice is grown in terraced fields. Marua, pulses, sun hemp and maize are also grown. It is very rich in minerals and contain the biggest deposits of coal and iron ore. It is destined to develop industrially.

Western Ghats: It forms the western edge of the upraised and tilted Deccan Block. Its western slopes get heavy rainfall and are covered by forest. In many respects conditions for the production of hydro-electric power are favourable here, and much potential energy can be tapped in addition to the present stations managed by Tatas and the Jog power station in Mysore. Rice and sugarcane grow on the rainy western slopes and the top of the crest. But in the undulating rain shadow region east of the crest jowar and groundnuts are more important. Timber and firewood is obtained from the forests.

Deccan Trap Region: This area consists of the north western part of the Deccan plateaus, where trap rocks prevail. They have given the land a distinct step like appearance. Flat topped scrub covered hills are mixed up with broad undulating plains where the regur or the black cotton soil prevails. Cotton and jowar are grown in summer and wheat and linseed in winter. Oranges, guavas and plantains are grown in large quantities.

South-eastern Deccan: In this part of Deccan red loamy

soils prevail which produce rice and sugar-cane with the help of irrigation. Groundnuts and pulses are also grown. Rainfall varies from 30 to 40 inches.

The Konkan Coast: This is the northern part of the Arabian Sea coastal strip. There being enough rainfall, it is a rice producing area. Backed by the Western Ghats, it is connected with the interior by the Narbada Valley, and the two railway lines to Bombay through Thal Ghat and Bhor Ghat. Much hydro-electric power developed in the Western Ghats is consumed here in the Bombay industrial belt.

The Malabar Coast: This coastal strip extends south of Konkan. It receives the first onslaught of the monsoon, and is one of the rainiest areas in India. It gets about 150 to 200 inches of rain annually. The dry season is only three months long. The winter is very mild. Here we find the nearest approach to equatorial climate in India. Rice is grown in the coastal plains and around lagoons. There are large coconut plantations and much copra and choir is exported. Spices grow in the damp warm climate. Rubber, tea and coffee are grown in plantations in the hills. The region is densely populated and is a food deficit area. Many industries have been developed getting power from hydro-electric power generated in the hills.

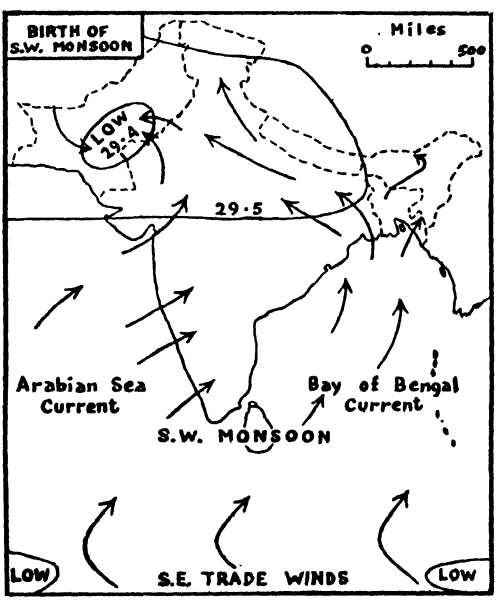
The Karnatak Coast: This is the southern part of the coastal strip on the eastern side of the Deccan Plateau. It is broader than the western coastal strip. Rainfall is not enough and irrigation is practised to grow rice, pulses, sugarcane and groundnuts. Rice is grown with the help of irrigation in the Kaveri delta, which is a rice exporting area. Sugarcane and cotton are grown in Madura. Tobacco is also an important crop. Various industries are also developing.

Andhra: This coastal strip between the Godavari and Mahanadi Deltas is narrower than Karnatak. Also, while Karnatak receives rain in November and December, it gets rain in the normal monsoon season, namely June to October. Rice is the chief crop, while tobacco, millets and sugarcane are also grown. The deltas of Godavari and Krishna are irrigated and are intensively cultivated. The hills at the back have manganese and iron ore deposits. They also produce timber. Cashew nuts are grown here.

CHAPTER—II

CLIMATE

Climate which is the average of daily weather readings consists of various elements namely rainfall, temperature, atmospheric pressure, wind velocity, wind direction, cloud amount, cloud type, sunshine, humidity, visibility and so forth. Of all these the first two are vital for a correct appraisal of agriculture. Amount of rainfall determines the type of agriculture. It can only be changed

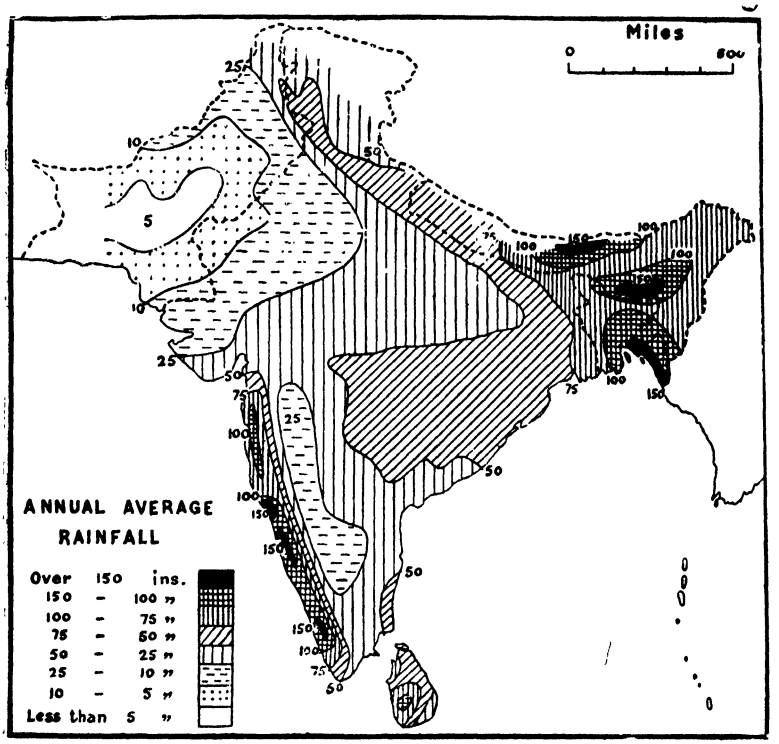


Map 5

by irrigation. Even to that there is a limit. Temperature also determines the growing period. For a part of the year, in higher latitudes, no agriculture is possible, as it is too cold. The number

of frost free nights puts a rigid limit on what type of plant can be safely cultivated. Temperature, however, has not much say in India, except in Kashmir and the Himalayas, above 8,000 feet. High temperature increases evaporation and so more rain is needed for plants.

Thus while discussing the climate of India, more stress should be laid on rainfall.



Map 6

Nearly the whole of India is influenced by monsoon winds. The simplest criterion to ascertain whether winds at a particular place should be called monsoons, is to see if there is a complete reversal of direction of winds during summer and winter. This is so in India. In summer the winds blow from S.W. and in winter from N. E.

Considering the permanent wind belts of the world, India lies in the N. E. Trade Wind belt. Thus other countries in the world between the same latitudes get the N. E. Trade Winds blowing all the year round. But this state of affairs changes in India during summer, when winds start blowing from the S. W. The cause lies in the juxtaposition of land and sea. The Indian land mass becomes very hot during May and June and develops a deep low pressure area in and around Sind and the Thar desert. This 'low' overshadows the belt of low pressure in the Doldrums near the equator into which the S. E. and N. E. Trade Winds usually flow. So with the disappearance of the Doldrums south of India the S. E. Trade Winds of the Southern Hemisphere flow across the equator into the Sind Low. But they turn eastwards and become S. W. winds after crossing the equator due to Ferrell's Law.

Of the total amount of rainfall received by India nearly 90 per cent falls during the S. W. monsoon period. The map showing total annual rainfall very much resembles that showing rainfall from June to October, when the S. W. monsoon is active. In studying the distribution of total annual rainfall the extent of the following zones may be noted.

Over 150": (i) Parts of Malabar coast
(ii) Assam Plateau
(iii) Darjeeling and Buxa Duars

Between 100" and 150": (i) Part of Konkan and Malabar
(ii) The whole of Assam Plateau
(iii) Eastern part of the Himalayas

Between 75" and 100": (i) West Bengal, Assam and Northern Purnea
(ii) The whole of Konkan and Malabar

Between 50" and 75": (i) Entire Western Ghats
(ii) Himalayan Foot-hills extending up to Kashmir
(iii) Bihar, Orissa and eastern part of Madhya Pradesh.

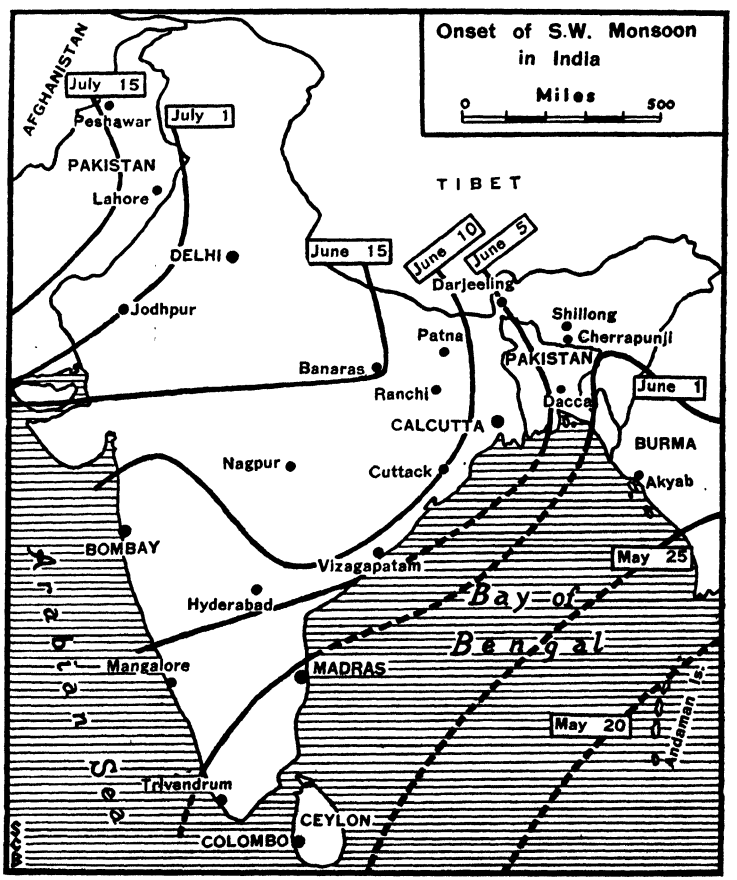
Between 25" and 50": The rest of India excluding (i) some portion of the western half of the Deccan Plateau in the rain-shadow of Western Ghats. (ii) Western Rajasthan, north-eastern half of (East) Punjab, parts of southern Uttar Pradesh.

A description of the four seasons of India will complete a brief survey of the climate of India.

The Four Seasons

According to the Meteorological Department of the Govt. of India* four seasons are recognised in this country:

(a) *Cool Season*: January and February
(b) *Hot Season*: March to May
(c) *Advance of S. W. Monsoon*: June to October
(d) *Retreat of S. W. Monsoon*: November and December

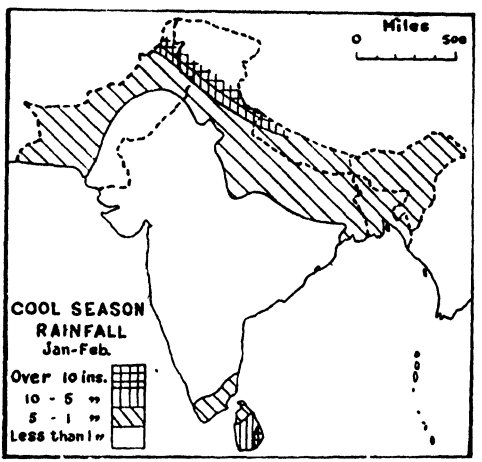


Map 7

*The Weather in India, By C. W. B. Normand; An outline of the field sciences of India.

The Cool Season (January—February)

In the beginning of January the N. E. wind current is well established. As stated earlier it is the Trade Wind of tropical regions, but in India it is termed as the N. E. monsoon (or winter or dry monsoon). North wind in winter usually is cold, dry and keen. It is accompanied by bright sunshine. It never produces rain.* It blows down the Gangetic basin as a dry cold N. W. wind, but becomes more truly N. E. in the peninsula and over the sea. It blows out from the large regional anticyclonic accumulation of cold heavy wind over Central Asia.



Map 8

During this season land depressions, known as *western disturbances* enter India from the north-west and spend themselves either in the west, or sometimes travel down as far as Bengal. They or secondary depressions associated with them usually produce foul weather, with some rainfall. Though this amount of rainfall is small, (nearly one or two inches in Punjab) it is very

* A wrong notion exists that N. E. monsoon gives rainfall on the eastern Madras coast. In fact it does not. It is always a dry wind coming as it does from dry cold land towards hotter latitudes, so that it absorbs rather than deposits moisture. Madras rain occurs, not in January and February when N. E. wind is strongest, but in November and December, the period of retreating S. W. monsoon. Refer to Climatology by Austin Miller, pp. 150 and Kendrew's Climate of the Continents, pp. 137. There may be some relief rain from N. E winds, when they are obstructed by the Eastern Ghats, but this is negligible.

useful for Rabi crop. The approach of these disturbances is marked by warm winds sucked in from south-east, gradual overclouding of the skies and rain, followed by a drop in temperature, as the disturbance passes away and the north wind springs up once again, which may bring a cold wave.

The rainfall is mainly confined to the north, and the Deccan Plateau is dry. There is heavy snowfall in the Himalayas during the passage of western disturbances.

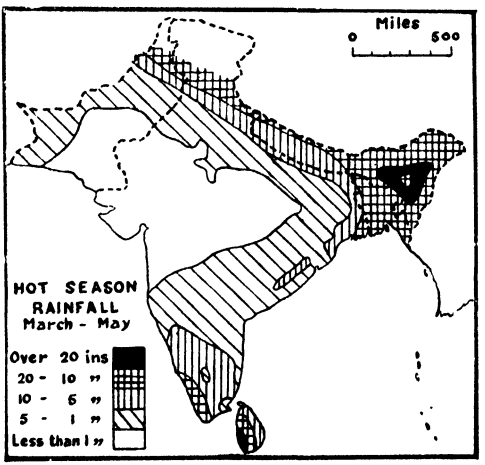
Thus two weather types prevail in the winter months:

(a) Cool North wind and clear skies,

(b) Cloudy weather and drizzling rain, with veering of wind during the passage of western disturbances.

The Hot Season (March—May)

March to May, the hot weather period, is one continuous increase of temperature and decrease of barometric pressure in North India. The belt of greatest heat in India gradually moves northwards. March is the hottest month in Deccan, with highest



Map 9

day temperatures reaching 100° F. In April the area of highest day temperatures, from 100° to 110° lies over the south of Madhya Pradesh and Gujerat. In May the whole of Northern India is in the grip of heat, which becomes unbearable in June, when day maxima of over 120° F. are not uncommon in the western parts. Three local phenomena during the hot season may be mentioned:

(a) *Nor'westers of Bengal and Assam*:

These are evening thunderstorms in West Bengal and parts of Assam. They generally approach from the northwest and hence the name. They are accompanied by a very strong wind, thunder, rain and sharp drop of temperature. The wind is sometimes so forceful that huts are blown away, trees are uprooted and boat disasters occur in rivers. But the rainfall is very useful for growing early crops such as "Aus" paddy. The cause of the production of Nor'westers is said to be the presence of a layer of cold heavy air above a surface layer of moist warm air blowing from the south. Convection currents set up in the day time force the warm moist air below, to rise upwards into the cold air mass. The cold air drops downwards while the hot moist air is converted into thunder clouds.

(b) *Dust storms of North-West India*

For nearly similar causes evening dust storms occur in East Punjab and U. P. The only difference is that there are no clouds or rain, and excessive heat does not allow any drop of temperature to be noted. They are of no consequence to agriculture.

(c) *Mango rains of South India*

Evening thunder rain also occurs in South India from convectional currents set up in the day time. The only difference is that there is no wind accompanying the storm. The rains are called mango rains for they help the mango fruit crop. They are also called blossom rains, as they help blossoming of coffee plants.

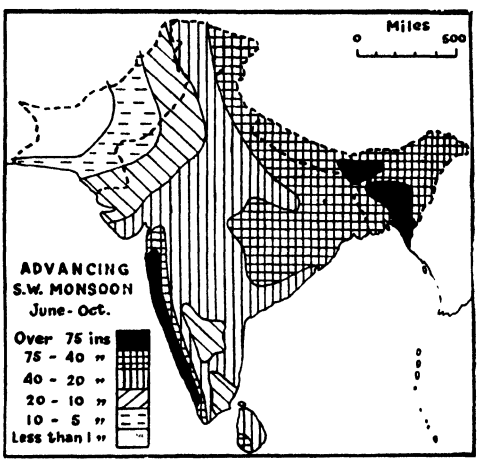
The Advance of the Monsoon (June—October)

This is the most important season from the point of view of agriculture, for nearly 80 to 90 per cent of the annual rain falls during this period in most of the Indian sub-continent.

It bursts on the Malabar coast during the first week of June, and spreads all over India by the end of this month. The configuration and hill features of India have a great influence in directing this current. The tapering peninsula in the very beginning bifurcates it into two currents, namely (a) *The Bay of Bengal current*, and (b) *The Arabian Sea current.*

The Bay of Bengal Current moves up the Bay and strikes the Arakan coast and Chittagong Hills with full force, the direction being south-westerly. But the greatest force is felt in the angle between the east-west plateau of Khasi Hills and the north-south

Lushai Hills. Here Cherrapunji receives nearly 500″ of rainfall in a year. The raingauge is kept at the Post Office, and a missionary registered 400″ more in one year by placing a gauge on an exposed hill top. The Brahmaputra valley is in the rainshadow of Khasi Hills and receives less than 100″. But rainfall increases again in the Himalayas. The monsoon current then turns westwards, and proceeds up the Gangetic Valley, giving more rain along the Hima-



Map 10

layas and less in the plains. Rainfall also decreases as one proceeds westwards. Thus the average rainfall from June to October for the following regions is:—

Assam	....	....	....	72″
W. Bengal	....	....	....	60″
Bihar	....	....	....	44″
Uttar Pradesh (East)		....	....	36″
Uttar Pradesh (West)		....	....	33″
(East) Punjab	....	....	....	18″

Another fact to be remembered in this respect is that the cause of the monsoon rain in these regions is twofold.

(i) *Relief rain*: This type of rain is caused by hills obstructing the passage of the current and forcing it upwards in cooler upper parts of the atmosphere, to condense and produce rain. Relief rain occurs in Assam and the Himalayas.

(ii) *Cyclonic rain*: During this season a number of depres-

sions or low pressure areas form near the head of the Bay of Bengal. They induce cloud formation and rain around them, with winds circulating round the centre in an anti-clock-wise direction. The depressions travel normally in a north-westerly direction up the Indo-Gangetic Valley, and carry rain and cloudy weather with them. But they become weaker as they go further inland, and so the amount of rain decreases westwards. Much of the rainfall in the Indo-Gangetic plains is from these cyclonic depressions.* They intensify the monsoon rainfall and tend to concentrate it in their vicinity. This also explains why the monsoon rainfall is not a period of continuous rain in any part of India, and changes rythmically from wet to dry spells as these depressions arrive and pass away. Bursts of general rain alternate with breaks.

An interesting fact to be noticed is that the area getting nearly 50" of rainfall extends westwards in Orissa and eastern M. P. This is due to the fact that many depressions travel in this direction and augment the rainfall of this region.

Arabian Sea Current: This current strikes the Western Ghats at full force and produces heavy rain (nearly 100" at many places) on its western scarp edge. But the major part of its moisture is wrenched from the current here, and as it passes away to the lee of the scarp, it is a descending, drying wind.

There is a sharp decrease from 100" to 25" on the eastward sloping plateau. The decrease continues eastwards. Thus the average rainfall for the monsoon period across the Peninsula from west to east, for the following regions is:

Konkan	105"
Bombay, Deccan	27"
Hyderabad, South	26"
Madras, Deccan	19"

Some depressions forming in the Arabian Sea and moving across the Konkan Coast help to produce heavy rainfall periods in this area.

Further north and west the Arabian Sea current becomes very weak, and rainfall from it rapidly decreases.

Thus the north-western part of Rajasthan receives no rainfall from either current. Hence it is a desert.

* The notion that the rain in the plains is from the monsoon current which returns southwards after being obstructed by the Himalayas, is quite wrong. Refer to "An Outline of the Field Sciences of India", pp-4.

The two monsoon currents start form the beginning of June and gather strength till the end of July, and rainfall increases up to the end of this month. The strength and amount of rain remains constant in August, and begins to loose strength in September. The general distribution of rainfall month by month from May to October over the Indian land is:—

May	....	....	....	3.1″
June	....	....	....	7.9″
July	....	....	....	11.2″
August	....	....	....	10.3″
September	....	....	....	7.0″
October	....	....	....	3.3″

There are four important variations from the normal during this period of monsoon rains:—

(a) *Late arrival of monsoon,*
(b) *A prolonged break in July or August,*
(c) *Early departure of monsoon,*
(d) *Late departure of monsoon,*

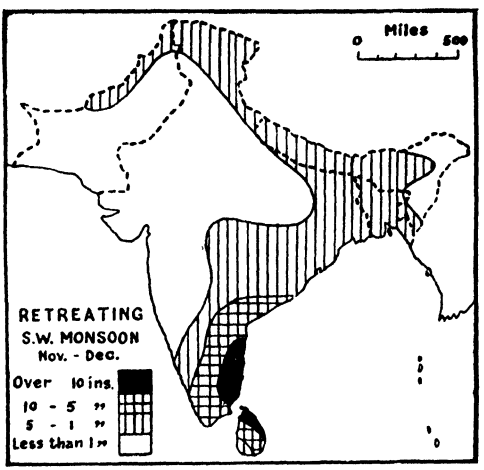
All these four variations have injurious effects on agriculture. But (b) and (c) have disastrous consequences, leading to famines if adequate protection is not provided by irrigation. A break in the middle scorches down the newly sown delicate plants. In 1946 this happened in West Bengal and paddy seedlings were scorched in their nursuries. Early departure of monsoon may not allow the ears to fill, or even to come out, and may result in a total crop failure. Late departure may spoil a ready harvest by excess of humidity.

Retreating South-West Monsoon: (November—December)

The two monsoon currents begin to retreat actually in October from the northern parts of India. Thus in November and December a completely dry season prevails in Northern India, but rainfall continues in the south. The Arabian Sea Current retreats from Rajasthan to Gujerat and to Deccan. The Bay of Bengal Current leaves Punjab in the last half of September. During October it gradually withdraws from the Gangetic Plain.

The effect of the retreating South-west monsoon is fully felt on the eastern coast of the Peninsula. The low pressure area in the north of the Bay of Bengal, slowly moves southwards. Depressions originating from it, moving westwards, strike the

Northern Circars and the Coromandal Coast, and give rain to thes regions. Thus the rainy season of Madras begins when it ends i Bengal and Orissa. The cause of Madras rain in November an December is the same as the cause of rain in the Gangetic Valle in June—October, namely depressions travelling westwards fron the Bay of Bengal. The current producing these depression is th South-west Monsoon in both the cases. Only in the Gangetic Valle it is advancing, and in Madras it is retreating.



Map 11

It is wrong to say that Madras receives all its rain from the N. E. monsoon. As already explained this current produces practically no rainfall, and it attains full strength, not in November and December, but in January and February.

A character of the monsoon rain is its great variability in both seasons, advance or retreat. The average annual rainfall of the Indian region is 42 inches, but variation from this normal was +12 inches in 1917, when the total worked out at 54 inches. On the other side it was −11 in 1899 when only 31 inches of rain fell. This is the chief cause of floods and famines in this unfortunate land. The variation is more accentuated in the dry regions of Punjab, Rajasthan, U. P. and Central Deccan, and variations of even 100 per cent have been recorded.

Irrigation and flood control schemes, such as those of Damodar, Mahanadi and Tapti are therefore of first importance to India.

Statistics of Monthly average Temperature and Rainfall (in °F and inches)

Station			J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.	Annual
Calcutta	°F	.....	76	76	80	83	86	84	81	81	81	82	81	77	81 (Average)
	In.	.....	0.4	1.0	1.4	2.2	5.6	11.9	12.7	13.4	10.0	4.9	0.6	0.2	64 (Total)
Cherrapunji		.....	53	55	61	64	66	68	69	69	69	66	61	55	63
(4300 ft.)		.....	0.7	2.3	10.6	31.3	50.9	103.6	107.5	81.5	49.4	16.8	2.3	0.3	457
Delhi		.....	58	62	74	86	92	92	86	85	84	78	67	60	77
			1.0	0.6	0.5	0.4	0.7	2.9	7.6	7.0	4.7	0.5	0.1	0.4	26.2
Darjeeling		.....	40	42	50	56	58	60	62	61	59	55	48	42	53
(7300 ft.)		.....	0.6	1.1	1.8	3.8	8.7	24.9	32.3	26.1	18.4	4.5	0.8	0.2	122.7
Simla		.....	42	42	50	59	64	68	65	64	62	58	51	42	56
(7200 ft.)		.....	3.6	3.7	3.3	2.7	3.9	8.8	21.1	20.7	7.5	1.4	0.5	1.3	79.3

Statistics of Monthly average Temperature and Rainfall (in °F and inches)

Station		J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.	Annual
Bombay	—	76	76	80	83	86	84	81	81	81	82	81	77	81
		0.1	0.1	—	—	0.7	19.9	24.0	14.5	10.6	1.9	0.4	—	72.4
Madras	—	76	78	81	85	90	90	88	86	85	82	79	77	83
		1.1	0.3	0.3	0.6	1.8	2.0	3.8	4.5	4.9	11.2	13.6	5.4	49.5
Kodaikanal	—	55	56	59	61	62	59	58	58	58	57	55	55	58
(7700 ft.)	—	2.9	1.4	2.0	4.3	6.0	4.1	5.0	7.0	7.3	9.7	8.2	4.4	62.3
Banaras	—	60	65	77	87	91	89	84	83	83	78	68	60	77
		0.7	0.6	0.4	0.2	0.6	4.8	12.1	11.6	7.1	2.1	0.2	0.2	40.6
Jaipur	—	61	65	75	85	92	93	86	84	84	80	70	63	78
		0.4	0.3	0.4	0.2	0.6	2.6	8.3	7.3	3.2	0.3	0.1	0.3	24

CHAPTER—III

NATURAL VEGETATION AND FOREST RESOURCES

Having acquired a clear idea of the physical features and climate of India, it will be easy to ascertain the various types of vegetational zones occuring in India. Rainfall has a great say in the matter, and barring very special circumstances such as those of altitude and salinity the vegetational zones, very nearly correspond to rainfall zones. We may divide the natural vegetation into the following types:—

(1) *Rainfall over 80"* *Evergreen rain forest,*
(2) *Rainfall 80"—40".....Monsoon deciduous forest,*
(3) *Rainfall 40"—20".....Tropical Savannah,**
(4) *Rainfall less than 20".....Dry forest.*

To these four types may be added two special types of forests namely:—

(5) *Mangrove forests*—found in tidal creeks of big river deltas.

(6) *Himalayan forests*—these may be further sub-divided into various types according to altitudinal zones.

Evergreen Rain Forest

A glance at the rainfall map (No. 6) shows where the heavy rainfall areas are, and it is in these areas that the Evergreen Rain Forest flourishes. Thus it is found in the following places:—

(a) *N. E. India*: Lushai Hills, Cachar, Khasi, Jaintia and Garo hills, a large portion of Assam, Himalayas

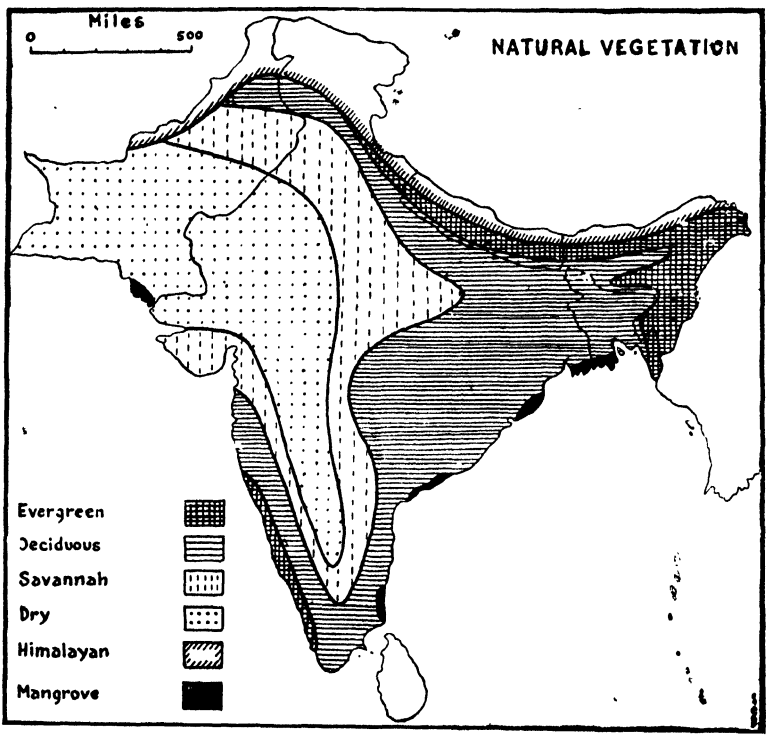
(b) *Western Ghats*: its western slopes which are exposed to the full blast of the monsoon

*This type of classification is generally found missing in common text books. But temperature conditions in India together with the rainfall belt 40"—20" suits this type of vegetation. Much of this type of vegetation, has however been cleared for purposes of cultivation.

(c) *Himalayan foot hills*: These forests are known as Terai and extend all along the foothills.

(d) *Much of the Andaman Islands*:

In these forests the annual rainfall exceeds 80", the average annual temperature is about 75°F., and the average annual humidity exceeds 70 per cent.



Map 12

The trees, bushes, shrubs and climbers found in these forests are generally evergreen. They can maintain their leafy cover all the year round, even during the dry winter and early summer, when the want of moisture is felt most, because there is enough subsoil water at all times. They should not be confused with the evergreen trees of Mediterranean Regions. The word 'rain' has been added after 'evergreen', to avoid this confusion.

In this evergreen rain forest, however, there is a mixture of many trees, which are not evergreen, and which are in the habit

of shedding their leaves in spring and early summer. Some of these are gregarious, such as sal (*Shorea Robusta*), and occur as large patches of *deciduous* forests. The word deciduous stands for the plants which shed their leaves to conserve water during dry periods. These deciduous patches are found more frequently in comparatively dry situations.

The exploitation of evergreen rain forest is limited by the extraordinary density and profusion of trees and the accompanying undergrowth and climbers. India suffers from lack of roads and railways, and it is more expensive to maintain them in dense forests. In fact no roads have been built for the exclusive purpose of tapping forests.

Another factor which militates against their exploitation is the great mixture of innumerable varieties. *Pure stands,* which means large areas, where only one kind of tree grows, are rare to find.

The evergreen forests contain many species of high economic value, and better transport facilities will go a long way in increasing the forest yield. Some important timbers occuring in these forests are given below :—

* *Chaplash* (*Artocarpus species*) yields a fairly strong and durable timber. It is suitable for furniture, ship-building, packing boxes and most general purposes. *Aini,* a timber of the same species is in great demand in South India. It is nearly as good as teak. While Chaplash occurs in N. E. India, Aini is found in Western Ghats.

Bishop wood (*Bischofia*) is well known in Assam where it is used for bridges, house-building etc. It is also found in Buxa Division of Bengal.

Poon (*Calophyllum*) is a hard and strong wood which is very easily seasoned. It can be easily worked. It is a first class structural timber. The chief source of supply is the Western Ghats and Coorg.

Toon (*Cedrela toona*) though only moderate in strength, it has the reputation of being fairly durable after seasoning. But it is easily attacked by white ants and borers. It is used for furniture, domestic building purposes, tea-boxes, toys and carvings. It occurs all along the sub-Himalayan tracts of India.

* Trotter, H. The common commercial timbers of India.

Boga-Poma (*Chikrassia*) is slightly harder and stronger than teak. It is used for furniture making and house-building. It occurs in Buxa Duars, Assam and Chittagong Hill Tracts (Pakistan).

Rosewood and Sissoo (*Dalbergia species*) rank among the finest of India's cabinet and furniture woods. Rose wood is well known on the European markets. It is also used in large quantities by the Ordnance Department in India for gun-carriage wheels, wagon parts and other purposes. The railways use it for floor boards and carriage work. Though evergreen these trees occur widely in India, specially the *sissoo* which is found in all the provinces of Northern India. Bareilly in Uttar Pradesh is a great centre for *sissoo* wood. Rosewood is chiefly found in Western Ghats in Bombay, Madras and Coorg. Supplies are limited in N. E. India.

Gurjan (*Dipterocarpus species*), also known as *hollong* in Assam, is a good strong wood but not very durable in exposed positions. They should always be treated with a preservative for outdoor use. If treated they rank high among India's building and general purpose timbers, and have been used as railway sleepers and done well. *Hollong* forms the bulk of the timber treated by the creosoting plant at Margherita in Assam. Large supplies of *gurjan* are available from the Andamans, Bengal and Assam. A slightly different variety occurs in Malabar. Indian forests can produce large quantities of this timber if need arises. Assam alone estimates the outturn of *hollong* at 12,000 tons per year.

Irupu or telsur (*Hopea species*) is a very strong, tough and elastic wood, twice as hard as teak. It is very durable, and is able to stand any exposure out of doors in the worst of climate. So it is much prized for boat-building, bridge work, piling, masts, cart-building and railway sleepers. It occurs in Bengal, Bombay, Andamans, Coorg and the West Coast.

Nahar (*Mesua ferrea*), though one of the hardest and strongest woods, is difficult to season, it is used for railway sleepers, boatbuilding (keels and masts), pit-props and piles. Assam has the largest supplies But it also occurs in the West Coast.

Besides the above mentioned timbers the evergreen rain forests abound in bamboos which are used for various domestic purposes and hut-building. As already indicated patches of deciduous

forest which occur mixed up with evergreen trees yield much good quality timber.

Monsoon Deciduous Forests

They occur in regions which receive an annual rainfall between 40 and 80 inches, and occupy a bigger area than the evergreens. This rainfall is not enough to supply subsoil water all the year round to allow the trees to keep their leafy dress. So they shed their leaves during spring and early summer, when the shortage of water is most acute. Again they should not be confused with the deciduous trees of the temperate regions, which shed their leaves when snow falls in winter, and subsoil water freezes. Hence the word "Monsoon" is added before the word deciduous.

Regarding the extent of monsoon deciduous forest the most important factor is rainfall (40"—80"). Another factor however is topography. The forest has been cleared from level land for cultivation, while it persists in rugged, hilly situations. Thus it occurs in the following areas :- -

(a) A belt of land running north-south on the *eastern slopes of Western Ghat,* east of the evergreen belt, in Bombay, Madras, Mysore, Coorg and Travancore.

(b) Hilly areas in eastern part of Deccan, including *Nallamalai Hills* and Eastern Ghats in Madras.

(c) *Central plateaus* including *Chotanagpur, Upper Mahanadi Valley,* hills of Madhya Pradesh and Malwa.

(d) *Himalayan foot hills,* a belt just south of the evergreen belt.

Monsoon deciduous forests are by far the most important forests in India as producers of timber and various other products such as lac, tassar etc. Teak and Sal, the most important timbers come from them. The great variety of useful trees found in them are given below :—

Sal (*shorea robusta*) yields a very hard, heavy and tough wood. This strong cross-fibered reddish brown wood is easily recognised. It is naturally durable and remains immune to attack by white ants and fungi for a long period. The life of the sal railway sleepers is about 18 years. It ranks as the most used and the best untreated sleeper wood. It is also the most universally used constructional and domestic wood of North, Central and East India.

It is used as beams, rafters, flooring, piles, bridging, railway carriage and wagon work, carts, tool handles and tent pegs. Sal is gregarious, and occurs in large pure stands in all the deciduous regions, and even in patches in evergreen forests.

Makai (*Shorea assamica*) is a much lighter and weaker wood. It occurs in Assam and is used for tea boxes.

Teak (*Tectona Grandis*) is a medium weight, strong wood of average hardness, but is of outstanding merit in retention of shape and durability. It is immune to attacks from white ants or insects for very long periods. It is relatively easy to work and takes a good polish. It is easily sliced by a rotary lathe. Sliced veneers of teak are used in Europe and are also available in India. It is the chief railway carriage and wagon wood, and the most important furniture wood. In shipbuilding it is in a class by itself. Teak occurs in the deciduous forests of the Deccan Plateau in Madhya Pradesh, Orissa, Bihar, Bombay and Madras.

Arjun (*Terminalia arjuna*) is heavier and harder than teak. It is easy to work, turns well and takes a good lasting polish. It is used for cart and boat-building, agricultural implements and pit-props. It occurs all over the deciduous region.

Bahera (*Terminalia belerica*) is very strong, but not durable if unseasoned. It is very suitable for plywood work. It is used for making boards, boxes and packing cases.

Kindal (*Terminalia paniculata*) is fairly strong and durable wood. It occurs in South India, where it is looked upon as an excellent general utility wood, and is frequently used as substitute for teak.

Laurel (*Terminalia tomentosa*) is a very heavy, hard and durable wood. It is used almost universally for building purposes, carts, agricultural implements, posts, pit-props, piles, wagon floor boards in railway carriage, electric casing and railway sleepers. It is also a cabinet wood of exceptional beauty. It is very widely distributed all over the deciduous region.

Andaman padauk. (*Pterocarpus*) is well known in both Indian and European markets. It is a first class cabinet wood and a fine strong constructional timber. It is very suitable for billiard tables, railway carriage work, ship cabins and saloons. It is a highly decorative wood. The sole source of supply is Andaman Islands.

Gamari (*Gmelina arborea*) is a durable, light weight wood of medium strength. It is used for furniture, panelling, boat building

and boxes. Being light, it is suitable for camp furniture. Supplies are not abundant. It is more plentiful in Bengal and Assam.

Anjan (*Hardwickia*) is an extremely hard, heavy and fairly strong wood. It is used for cart wheels, ploughs, tent pegs and godown flooring. It is usually found as a scattered tree, but occasionally occurs in gregarious patches.

Kanju (*Holoptelea*) is neither a strong nor durable wood, but it is a common and well-known timber in North Indian deciduous forests. Western Uttar Pradesh alone produce 90,000 cubic feet per year. It is used for cheap grades of furniture, box shooks, match boarding, cotton reels and slate frames.

Jarul (*Lagerstroemia flos-regina*) is a medium strength, durable wood and easy to saw and work. It is extensively used for railway wagon flour boards, house and boat building. It occurs mostly in N. E. India, and is a very well-known medium weight constructional wood in these parts.

Benteak (*Lagerstroemia lanceolata*) is a wood which approaches teak in weight and strength. It is a very popular wood for some West Coast parts for boat building. Arabs buy it in large quantities for building their dhows. It is also used for house and carriage building.

Lendi or Sidha (*Lagerstroemia parviflora*) is a strong and durable wood and is used extensively in the form of posts, beams and rafters. It is found all over India, but specially in Bengal and Bihar.

Jhingan (*Odina Wodier*) is neither strong nor durable, but is largely used as a cheap timber. It is a very common tree in the plains of Northern India.

Kaim (*Mitragyna parvifolia*) is a pale yellow wood, slightly lighter than teak and very easy to saw and machine. It is fairly commonly used for toy-making, turnery, combs, cups, platters bowls, frames and walking sticks. It is recommended for bobbins, penholders and mathematical instruments. It occurs as a scattered tree and large supply in any one place is not available.

Mulberry or Tut (*Morus*) is a shock resisting wood of medium durability. It is highly prized for its use in sports goods, such as hockey sticks, tennis rackets and cricket stumps. It is now grown in plantations in Punjab.

Kusum (*Schleichera trijuga*) is a very heavy, hard, strong and tough wood. This quality makes it popular for oil and sugar mills, hubs of wheels, mortars, bearings and tool handles. It occurs all over the deciduous forests. 'Lac' insects are also reared on it.

Ebony or abnus (*Diospyros melanoxylon*) is a very dark green or greenish black wood of great strength, toughness and shock resisting ability. It is durable and not very difficult to saw and work. Its most common uses are turnery, carving, walking sticks, umbrella handles and inlay for furniture. Fair quantities can be obtained from all over the deciduous regions except the N. E. parts.

Axle Wood (*Anogeissus latifolia*) is a wood of great strength and durability. It is a first class tool handle wood and is also used for making plough handles and cart axles. It is found all over the deciduous forests except the North-East.

Khair (*Acacia catechu*) is primarily used for the production of *Khair or katha* used for chewing beetle leaves (*Pan*). But it is also a valuable timber and its great strength makes it very useful for house construction, rice pestles (*Dhenki*), oil and sugar cane crushers, ploughs, tent pegs and keels of boats. It is found all over the deciduous forests.

Haldu (*Adina Cordifolia*) is a fairly hard and strong wood. But its great quality is the great ease with which it can be worked and turned. Being very close-grained, it finishes very easily to a smooth surface. It is in great demand in India as well as in Europe, as an excellent light-coloured wood for turning, carving, panelling, bobbins, toys, combs, fret work and rulers. It is found scattered all over the deciduous forests.

Siris (*Albizzia*) is a fairly strong wood but only moderately durable. It is excellent for high class furniture, interior decorations and panelling. It is obtained in limited quantities all over the deciduous forests.

Palas (*Butea frondosa*) is not important as timber, but it is important for its crop of 'lac' insects, which are reared on it. It is gregarious and occurs in big patches on the Chotanagpur Plateau. It is however found scattered all over the plains of Northern India.

Mahua (*Bassia latifolia*) is a very large deciduous tree common in Chotanagpur Plateau. Though the timber is very useful, it is not easily cut down. The flowers are an important article of food. When dry they store well. A coarse spirit distilled from the mahua is the liquor most generally consumed in

the plateau land. The fruit is eaten ripe, as well as unripe. The kernel of the fruit yields an oil which is used for culinary purposes. It is also used for adulterating ghee.

Hurra or Har (*Terminalia chebula*) is a large common tree. It yields myrobalan of commerce. The fruit is used for various medicinal purposes.

Semul (*Bombax malabaricum*) is well-known for the cotton it yields, being much prized for stuffing pillows. The wood is very soft and highly perishable. It is one of the most universally used timbers for matchbox manufacture. It is also used to make packing cases and splints.

Savannah Lands

This type of vegetation is very common in nearly all the tropical lands of the world, and specially the central parts of Africa, where the savannah grasslands girdle round the equatorial forest of the Congo Basin. In India a part of the central portion of the Deccan Plateau and areas in North West India, have a climate very similar to the savannah lands of Africa, namely about 20 to 40 inches of rainfall in summer and a dry winter, with a great range of temperature, very hot summers and cool winters. The natural vegetation of this zone, as in African savannah is unable to support a tree forest. A mixture of tall, rank tropical grasses with trees here and there is the most common natural cover of this region*. Much of this type of vegetation however has been removed from fertile plains for cultivation, and the few trees cut down to provide fuel and timber. The savannah vegetation has, therefore, disappeared from much of the area. Yet it persists in large patches here and there in uncultivated uplands, to give it a place in the vegetation types of India. Unfortunately it has not been recognised as such by some geographers, while others have given it, its due place.

It occurs in one continuous belt of land through Punjab, Uttar Pradesh and Rajasthan, lying between the deciduous forests to the east and the deserts to the west. The southern portion of the belt continues southwards in Deccan as a wedge between the deciduous forests to the east and west. Savannah lands also

* M. E. Hardy, Plant Geography.

occur in sandy or pebbly soils south of the Terai jungles,* old infertile alluvial tables** occuring in patches in the plains of the Punjab and Uttar Pradesh, the Trans-Jamuna Tract, and favourable spots in Deccan containing swaying vistas of *kans* or *munj* grasses. In places where cultivation is not possible due to lack of irrigation facilities or slightly raised situation, rank grasses pervail. The only use to which such areas are put, is grazing. Some grasses have some economic uses such as ropemaking, thatching and fuel. Patches of grasslands also occur mixed up with deciduous forests in marginal areas. Here *Sabai* grass is found. It is used for rope-making and pulp for paper industry.

Dry or Xerophytic Vegetation

When rainfall is less than 20 inches per year, only a special type of dry vegetation can grow. It occurs in India in nearly the whole of Rajasthan, excluding only the south-eastern parts and the adjoining districts of (East) Punjab and Uttar Pradesh. Thus it is found in:—

(a) Punjab—Rohtak, Gurgaon, Hissar and adjoining parts of Patiala and East Punjab States Union (PEPSU).

(b) Uttar Pradesh—Mathura and Agra.

(c) Rajasthan.

(d) A thin wedge in Central Deccan.

Plants growing in this zone have very thin leaves or no leaves. Their stems and leaves are often covered by spines. They possess large roots. Plants with such characters are called *xerophytes.*

Babul (*Accacia arabica*) is the most important tree of this zone. It yields an extremely strong, hard and tough wood. It is a very popular and useful fuel wood, and growing in a zone, where trees are few, it is much used for this purpose. It is also very popular for parts of carts, and for ploughs, harrows and clod-crushers. Its best source of supply is Rajasthan.

Other characteristic trees are *Jhand* (*Prosopis spicigera*), and various species of *Tamarix, Salvadora* and *Capparis.* Palms and cactii are common, but are of little use. Even the heights of Aravalli Range, including Mt. Abu plateau, are clad with cactii

* The *Bhabar* lands in Himalayan foot-hills.

** *Ganga Khadar* in United Provinces.

and palms. *Karil* is a very common leafless bush. Various gums and resins are obtained from Xerophytes, including one from babul.

Mangrove Forests

Unlike the four types of forests discussed earlier, the mangrove forests do not depend on the amount of rainfall, as they occur in and around tidal creeks in river deltas. The special conditions to which the plants in them, have to adapt themselves are:—

(a) Saline water.
(b) Rise and fall of tides.
(c) Deep accumulation of mud.

In India these forests occur in their densest form in the *Sundarbans* in the Gangetic Delta, (part of the Sundarbans is in Eastern Pakistan), the *Mahanadi, Godavari, Krishna* and *Kaveri Deltas*. They are sometimes called *Tidal Forests*.

The plants adopt various means to fight against the drawbacks mentioned above. Some send up from their subterranean roots a multitude of aerial root suckers which act as respiratory organs—a veritable forest of spikes jutting out from the ground. Others stand on branching out stilt like roots, e.g., *Keya* bushes. Yet others develop *viviperous* fruits which start new life while in the branches, and are provided with spikes, so that when they fall, they stab themselves in the mud as already growing plants.

The forests supply much fire-wood, honey and tanning material. Two timbers are important:—

Sundari (*Heritiera minor*) is one of the heaviest timbers, being 50 per cent heavier than teak. It is a very hard, tough and strong wood and extraordinary durable. A boat built of sundari lasts quarter of a century. Although hard, it can be worked easily. It is used for boat building and as fuel in Calcutta. The main source of supply is Sundarbans.

Pussur (*Carapa moluccensis*) is a heavy, hard and fine even-textured cabinet wood, very easy to work. A Calcutta firm used it for making gramophone and radio cabinets, but they reported the existence of curious knots and blemishes in it, which made it unfit for high class work. Limited supplies can be obtained from Sundarbans.

Himalayan Forests

Distinctive altitudinal belts of various types of vegetation occur in the Himalayas. No other hills in India bear coniferous forests, alpine vegetation and the snow line. Hence, while forests covering hills other than the Himalayas have practically no distinctive character, the Himalayan Forest belts are unique in India.

The altitudinal belts vary slightly in the eastern and western parts of the Himalayas. They also differ according to the aspect of the area, there being marked differences between the sunny, monsoon swept southern face and the dry, shady northern face. Generally speaking the zonal limits are slightly lower on the northern face which is shady and therefore cooler. Their approximate position is given in diagrams 13 and 14.

The following zones may be noted in Western Himalayas:—

(a) *Scrub jungle and dry forest*: up to 3,000 feet. It resembles the dry forest zone. Higher up near springs and streams deciduous trees are found.

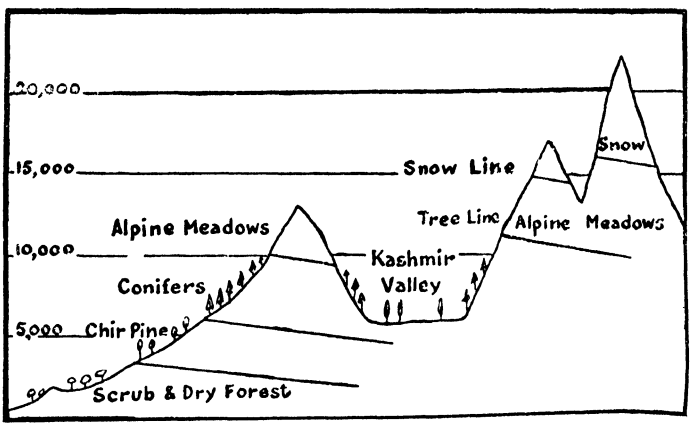
(b) *Chir pine*: 3,000 to 6,000 feet. This tree is gregarious, and is sometimes found for miles. Besides being a useful light timber, it is a source of resin. Lack of transport is mainly responsible for its not being fully exploited.

(c) *Coniferous forest*: 6,000 to 10,000 feet. It resembles the Taiga of Siberia, and contains nearly all varieties of conifers, such as spruce, fir,, cedar etc., common in Taiga. The unique opportunity it provides India for producing soft wood, naval stores and wood pulp is yet unrealized. Timber is cut and floated down rivers, but inaccesible parts remain untouched. The immense water power in this area also goes to waste. If it is fully harnessed, the electrical power may lead to the setting up of saw-mills, woodpulp plants, paper, rayon and match factories.

(d) *Alpine meadows*: 10,000 to 15,000 feet. They occur between the tree line and the snow line, which may change according to the aspect. Sweet grasses, shrubs with cushioned leaves, brightly coloured flowers and gregarious *rhododendrons* constitute the vegetation of this zone. The only economic use of this area is its use as pastures during summer for herds of cattle and sheep which move up at this time of the year. This practice, known as ***transhumance,*** is common in Kashmir.. Wool, cheese and butter

are the products of this zone. While cheese and butter are consumed in the hills, wool is worked to produce shawls and carpets, for which Kashmir is famous.

(c) *Eternal snow*: above 15,000 feet. It acts as a great water reservoir of India.



Map 13

Section across Western Himalayas showing vegetation zones.

The belts in the Eastern Himalayas are slightly different. They are given below:—

(a) *Terai forest*: up to 4,000 feet. It resembles the evergreen forest, though it also contains deciduous trees like *sal*. Tall grasses and bamboos occur extensively in this zone.

(b) *Evergreen oak forests*: 4,000 to 8,000 feet. They contain various European trees. Magnolias are very common—one species (M. Campbellii) formerly clothed the slopes round Darjeeling. The belt is characterized by oaks, laurels, maples, birches and alders.

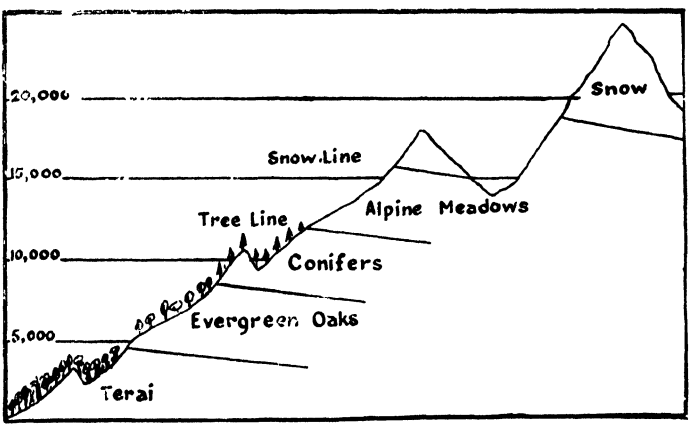
(c) *Coniferous forests*: 8,000 to 12,000 feet. Like their counterparts in Western Himalayas they contain silver fir, yew, spruce and Deodar.

(d) *Alpine vegetation*: 12,000 to 16,000 feet. It is also similar to that in Western Himalayas and contains rhododendrons and junipers. Trees are absent.

(e) *Eternal snow*: above 16,000 feet.

Some important timbers of the Himalayan forests are given below:—

Indian Birch (*Betula alnoides*) is a good quality, straight grained even textured greyish wood. It is a first class timber for interiors of furniture, and is perhaps the best suited for plywood work. It is very easy to work. Tool handles are made from it.



Map 14

Section across Eastern Himalayas showing vegetation zones.

Calcutta firms use it for making gramophone and radio cabinets. Extraction at present is only in small logs by ropeway in Darjeeling.

Cypress (*Cupressus torulosa*) is the best conifer wood which India possesses. It is durable and much freer from knots than other conifers. It is used for bridge and house-building. It might prove suitable for aircraft. Garhwal and Kumaon hills have good supplies.

Chir and Blue pine (*Pinus species*) occurs in Punjab, Kashmir, Garhwal and Kumaon Himalayan regions. They are not durable if untreated by a preservative. They are easy to saw and work. They are weak, light woods, and used as railway sleepers when treated. Other uses are for shingles and packing cases.

Spruce (*Picea Morinda*) also occurs in Western Himalayas. It is a light wood, not very strong or durable. It is very easy to

work, but contains many knots. It is used for planking, cheap furniture, boxes and crates.

Fir (*Abies pindrow*) occurs in Western Himalayas like pine and spruce and is similar to them in quality. It is used for packing cases, containers and fruit crates. It is suitable for paper pulp, and is one of the few Indian woods which might be suitable for aircraft work, once a specification for selection is worked out.

Distribution of Forest Areas

Assam leads in the area under forests, and is followed by Madhya Pradesh and Madras. The following table gives the area in hundred square miles of Reserved forests, total area under forest department and timber and fuel produced in million cubic feet for 1946-47.

State	*Reserved*	*Total*	*Timber and fuel*
Assam	67	213	15
Madhya Pradesh	194	194	66
Madras	158	159	36
Bombay	106	107	72
Uttar Pradesh	52	62	68
Punjab (East)	4	48	23
West Bengal	26	26	16
Orissa	14	28	9
Andamans	15	22	2
Bihar	14	22	9
Coorg	5	8	1
Ajmer	1	1	.4
Total	658	890	316

Growth of Forests and Loss by Decay*

All the forests of India covered nearly 14 per cent of the total area of the country in 1946-47.

Estimates based on state returns show that they were providing wood at the rate of 16 cubic feet per acre per year. Loss by fire is estimated at 1.6 per cent and by decay 2.4 per cent. Average area burnt out annually is about 2,500 square miles.

*Benn: Resources of the Empire, Timber and Timber Products. pp. 63.

Fortunately all of it is not first class forest. Inspite of all this loss, it seems that the forests are not being fully worked. Nearly 1,000 million cubic feet could be harvested, if tapping is spread uniformly all over the area. But in 1940-41 the total produce was less than 400 million cubic feet, timber and fuel amounting to 280 and minor produce to 110 million cubic feet. The full working of the forest is not possible unless transport facilities are improved.

Forest Products, Major Produce

This includes timber and fire wood. Its production in 1946-47 was 316, 333, 499 cubic feet. The produce consisted of nearly 3 million sleepers, various timbers, firewood and charcoal.

Minor Produce

Bamboos: They have a wide distribution all over India. There are numerous kinds of bamboos from giants of Assam to dwarfs of dry regions. They are put to innumerable uses including the construction of huts. A number of bamboos yield a very good quality pulp used in paper making.

Canes: They occur in marshy situation specially in tidal forests in the river deltas. Cane grows in the swamps surrounding Lake Wular in the Kashmir Valley.

Grasses: *Sabai* grass has been used for paper making. Other grasses such as ullu, nal etc., also yield satisfactory pulp. The Savannah grasses are of little use as fodder. They are universally used for thatching and fuel.

Khas or *Bena* grass roots are used for making Khas tatties, used as coolers in summer season. Of Aquatic grasses *Shola* grows in marshes of West Bengal. Its pith is used for making shola hats, ornaments and crowns for religious occasion and buoys for fishermen's nets. *Hogla* or *Tiger Grass* is used for making mats. High quality mats are made from *Madur Kati*.

Tanning Materials: A great variety of them are found of which *myrobalans* are most important. They are the fruits of *Terminalia chebula*. They are found all over the deciduous forests. Their export to Europe for use in making dyes has fallen, since the production of synthetic dyes. They are however used in India for dying cotton, wool, silk and skin. Production of myrobalans is nearly 50,000 tons

Sandal wood is utilized for producing sandalwood oil, and this industry is well established in Mysore. From the oil, soap and scents are also made. The wood is used for making beautifully carved boxes and toys at Sagara in Mysore.

Lac industry is virtually an Indian monopoly. The recent production of synthetic resin in U.S.A. which is our best buyer may affect the industry badly. U.S.A. buys lac from India for making gramophone records and the synthetic resin is said to produce even better records. The lac insect (Tchardia lacca) lives on sidha, palash and some other trees in deciduous forests. Various uses of lac are the manufacture of varnish, sealing wax, lithographic ink, gramophone records and electrical industry. The most important area of lac production is Chotanagpur in Bihar. Tori is a great exporting centre of lac. Thousands of people are engaged in the industry. 98 per cent of lac is exported.

Resin and *Turpentine*: It is obtained from chir pine found in Western Himalays between altitudes of 3,000 to 6,000 feet. It is mainly used for varnishes and paints. Its production can be increased immensely if transport facilities are improved. Tapping takes place all along the Kathgodam—Almora road. There is a turpentine factory at Kathgodam. Recently new roads have been built in the Kumaon hills and increasing quantities of resin are being tapped. Numerous collection depots have been established. Fresh chopping of the trunk is allowed only once a fortnight to stop excessive bleeding.

Other minor products of forests include medicinal herbs, such as *Nux vomica* and various kinds of oils and scents derived from plants.

Forest Industries employ a very large number of people. They include Sleepers, Lumbering and Timber yards, Saw mills, Veneer and Tea chest mills, Furniture factories, Bobbin factories and turneries, Match factories, Resin and Turpentine factories and Charcoal making industry

CHAPTER—IV

SOILS AND SOIL EROSION

The three main physical divisions of India, namely the Mountain Wall, the Indo-Gangetic Valley and the Deccan Plateau are also the three distinctive regions of soil.

Soils of the Mountain Wall

The soils of the mountain wall are extremely varied in character composition and fertility, and depend upon the altitude and topography. *Glacial soils* occur just below the snow line, where unassorted gravel and sands pour out with water coming out from the snouts of glaciers. Deposits of *boulder clay* occur further down, which glaciers have left behind in their retreat upwards.

In the coniferous forest belt *podosolic soils* occur. They are infertile and only support forests. Potatoes however grow easily in them. *Brown forest soils,* which are good for orchards, occur in oak, walnut, chestnut, beech and birch forests. *Lateritic soils* and *red loams* occur in patches in lower valley slopes and foothills in the West, as for example in the Jammu Pathankot foothills and between Kosani and Garur in Almora district.

Soils of the Northern Plains

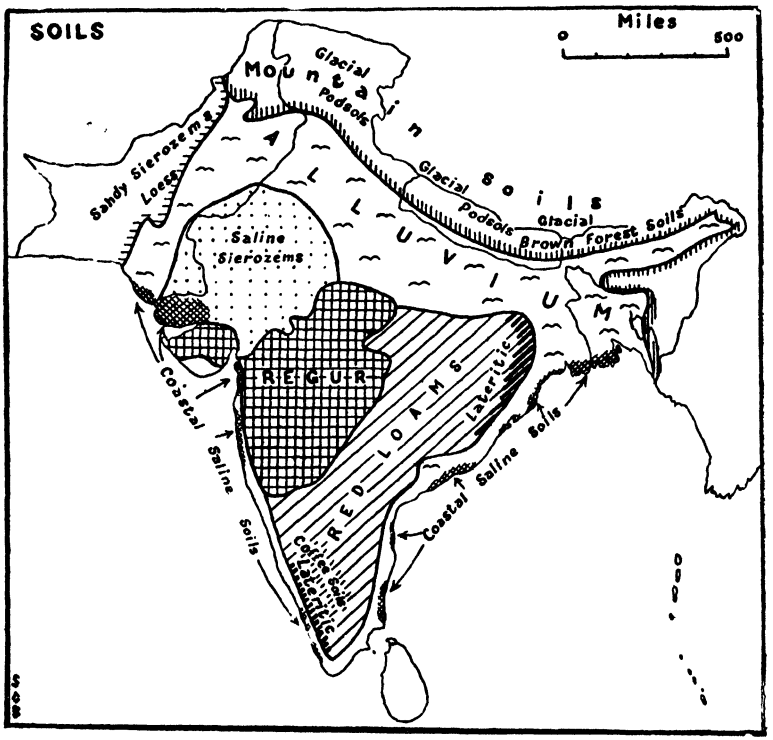
The great stretch of alluvial soils is spread in a vast sheet in the Indo-Gangetic basin. The alluvial soils may be divided into two types according to age.

(i) *Old alluvium*: It occurs in patches and strips of high ground, away from the rivers, in between valleys or along the foothills. They are infertile, being old and leached (fertile mineral constituents of soil are washed away by rain). They often contain concretions as in Punjab and Uttar Pradesh.

(ii) *New alluvium*: It spreads over the flood plains of the rivers, and is very fertile, except when sandy or too saline. According to texture (size of grains) it may be divided into three types.

(a) *Sandy soil*: It is coarse grained and porous. So it does not hold water. It is poor in plant food. Watery vegetables, water melons etc., grow in it.

(b) *Clayey soil*: It is very fine grained, and so stiff and heavy. Owing to compactness it hinders percolation of water and development of plant roots. It however becomes friable with the



Map 15

presence of calcium and humus (organic matter). It is rich in plant food.

(c) *Loamy soil*: It is a mixture of sand and clay and contains the good qualities of both. It is, therefore, friable, holds water and is very fertile. It is most common in the plains.

Generally speaking clay is more abundant near river mouths, while sand is common in their upper courses.

Two more types of soils, resulting from extreme type of climate and environment in the westernmost and easternmost parts of the plains may be mentioned:—

(d) *Desert and Semidesert Saline soils.* They occur in the Thar Desert and lands adjoining it They have been termed as *Sierozems* by Sokolowsky.*

(e) *Saline marshes and peat bogs* of the Gangetic Delta and coastal lagoon areas.

Soils of Deccan Plateau

As contrasted with the *alluvial* (water transported) deposits of the Northern Plains, the soils of the Deccan Plateau are *residual*, i.e., soils which remain on the uplands, after the portion which is carried away by rain water. Two main types of residual soils are recognized:—

(i) *Regur or Black Cotton Soils*: They occur in a triangle roughly bound by Ahmedabad, Sholapur and Nagpur. This area also roughly indicates the extent of the Deccan Trap basaltic rocks The black colour of basalt may be responsible for the dark nature of the soil, but this theory is not supported by all pedologists, for black soils also occur in adjecent sandstone areas**, and red loams on the trap rocks. Regur soils are clayey and heavy, and highly retentive of moisture. So irrigation is absent in this zone. Jowar and cotton are the two main crops. The best and the richest regurs occur in valley bottoms (Tapti valley), while thin regurs are found on hill tops.

(ii) *Red loams*: Nearly the whole of the remaining area of the Deccan Plateau is covered by red loams. They are light and sandy (being products of crystalline rocks which give out quartz grains on weathering). So they are less retentive of moisture and are irrigated for growing rice, sugarcane and cotton.

Two minor varieties of soils may also be noted:—

(iii) *Lateritic Soils*: They are red coloured soils rich in iron and aluminium. They occur on plateau fringes, specially in Malabar in Western Ghats and eastern fringes of Chotnagpur Plateau and Andhra coast. Only when manured and watered they give garden lands.***

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* Soils of India: Sokolowsky.

** Pedology: Robinson, Chapter XVI.

*** The Deccan Plateau: Simkins.

(iv) *Coffee Soils*: They are red loamy forest soils, rich in humus. They occur on hill slopes in Nilgiri Hills and Western Ghats.

Soil Erosion

Erosion means the gradual weathering of the surface of the earth and the removal of the weathered material by agents of erosion, namely water, air, ice and so forth. *Normal erosion* goes on continuously all over the surface of the earth. *Soil Erosion* is different from it. It means the excessive removal of unprotected soil by running water and wind. Normally when soil is protected by natural cover, either forest or grassland, there is no soil erosion. When this has been removed for cultivation or over-grazing, and no proper precautions are taken, soil erosion is the result.

In India soil erosion has reached enormous proportions. It occurs specially in the foot-hills of North Western India and in the Deccan Plateau, from where millions of tons of soil is being washed away into the rivers and the sea every year.

Causes of soil erosion (i) *Deforestation*: This is the most important cause. Much of the forest area was cleared for cultivation, but much more was, and is being mutilated by injudicious felling of trees for timber, firewood and charcoal. 'Jhum' cultivation by jungle tribes is also the cause of much forest destruction. To stop damage to forests the Government demarcated some forest areas as protected forests. But even to-day protected forests are only 25 per cent of the total forest area. The remaining 75 per cent are in the process of mutilation.

(ii) *Over grazing*: This leads to removal of grass and young plants. Goats are specially injurious. Over-grazing gives no chance to the forest to re-establish itself. The bare soil is easily eroded.

(iii) *Unscientific methods of agriculture*: Absence of any crop on sloping land is very dangerous during rains. Furrows some times run down the slope and help soil erosion.

(iv) *Injudicious removal of soil* for road building, brick making and other constructional work. If proper care is not taken it leads to soil erosion.

Results of soil erosion: In a land attacked by soil erosion, there is *sheet erosion* in the first stage. *Erosion gullies* then form

and spread out like wild fire. Roots of trees are exposed and they soon fall down. Rain water runs very swiftly on the bare soil and carries away much sand and silt. Water does not percolate into the ground. Springs dry up as the source of subsoil water diminishes. Thus while rivers are flooded during the rainy season due to quick run off, they are practically dry in winter. One of the main causes of floods is soil erosion. The sand which is carried by the rivers is deposited in their lower parts and chokes them. This leads to flooding of adjoining land. The removal of the top soil makes the area poor and infertile and ultimately useless for cultivation.

Remedies to check soil erosion:—(i) *Afforestation*: Areas from where forest has been removed should be forested once again. Mutilated forests should be nursed back to full vigour. Area under forests in India is 14% of the total area, while for a balanced use of land 25% of it should be under forests. So the need for afforestation is evident.

(ii) *Controlled grazing*: Grazing should be restricted. It should be allowed only by rotation. Special areas should be earmarked for this purpose.

(iii) *Scientific methods of cultivation*: Keeping of cover crops, contour cropping, terracing, level furrowing etc., should be taught to the farmers to check water from running down the slope.

(iv) *Gully plugging** and anti-erosion treatment of the land already eroded. *Bunds* should be constructed to shut gully mouths. Level bunds should be built on eroded land and trees and grass should be grown on it. Some work in this line is being done in West Punjab, and at Shantiniketan.

Soil erosion is an ever increasing menace in India, and without checking it, it is futile to talk about growing more food, and controlling floods by multipurpose projects. Soil erosion is at the base of all the trouble. Soil erosion control will lead to control of floods, even up flow in rivers, increase the fertility of soil and remove choking of rivers, which leads to the disruption of drainage.

* Soil Erosion: Gustafson.

CHAPTER—V

IRRIGATION

Nearly all the rainfall in India and Pakistan is from the South West Monsoon. Referring to Chapter II, it may be noted that (a) the average annual rain decreases towards the west and south in Northern India and suddenly decreases towards east of Western Ghats; (b) its arrival or departure fluctuates, and it may partially fail in the middle of the season; (c) there is a great variability from the normal, which increases where the amount is less.

For the above causes, it has been said that *"Agriculture in India is a gamble in monsoon."* It is actually so where irrigation does not exist. Big irrigation canal systems exist in Punjab and Uttar Pradesh, while some exist in South India. Raising water from ponds and streams is common in Eastern India, while watering from wells is common in the middle Gangetic Valley and coastal districts of Deccan. Tank irrigation is practised in the eastern half of the Deccan Plateau. The following types of irrigation practices may be noted:—

(1) *Donga*: This is a boat-shaped device made of tin or excavated palm tree trunk, by which water is raised from ponds and streams. It is common in West Bengal. Another method used in the same area is the swinging of a basket by two men, by which water is raised from a lower to a higher level.

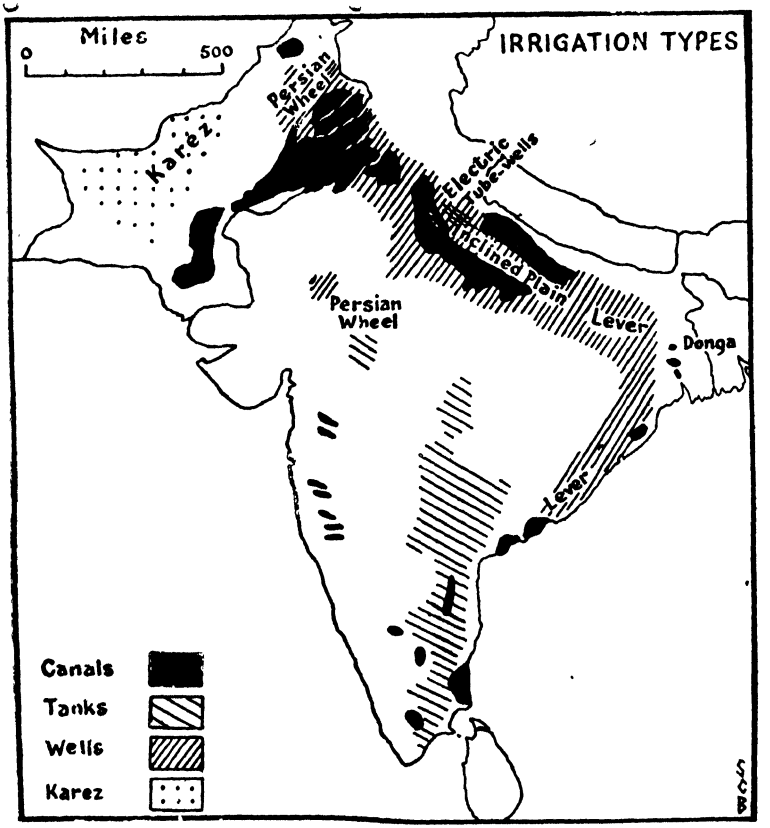
(2) *Well Irrigation*: This extends all over the plains up to Punjab, and is also common in Andhra. The greatest concentration is in Uttar Pradesh. Three methods are used for raising water:

(a) *Lever method*: A bucket is attached to the longer arm of a long pole, acting as a lever, and a heavy weight at the other end. It is common in Bihar and Andhra.

(b) *Inclined plain*: This method is used in U. P. A pair of bullocks who draw water move down an inclined plain, as a big leather bag full of water is hauled up.

(c) *Persian wheel*: It is used in the Punjab and in Mt. Abu in Aravalli Hills. Its use is being advocated by Governments of other States.

(3) *Tank Irrigation*: It is practised in the Eastern part of the Deccan Plateau. The topography is suitable for erecting dams

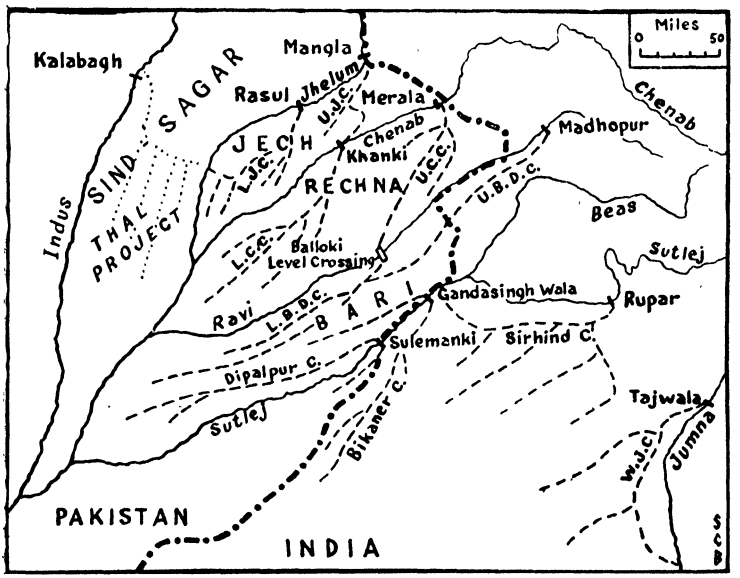


Map 16

across small rivulets and collecting water in artificial lakes so formed. Some of these tanks are very big in size. Water is taken from the tanks running down grade into the fields. While big tanks (or rather lakes) contain water all the year round, smaller ones dry up in early summer.

(4) *Electric Tube-wells*: They have been used for purposes of irrigation in U.P., where the "Ganges Valley State Tube-well

Irrigation Scheme" has provided 1,500 giant tube-wells, each with a yield of 1½ cusecs. Power is supplied by the U.P. Grid Syestem (see Chap. VII). The scheme protects 1½ million acres of culturable land lying between the Ramganga and the Ganges, and between the latter and the Jamuna, covering six western districts of U.P. Moradabad has 429 tube-wells, which is the largest number for one district.



Map 17
Canals of East and West Punjab.

(5) *Major Canal Projects*:

The most important canal systems were developed in the undivided Punjab and the partition has cut asunder some of them. The system consists of a pair of canals for each of the three central *doabs* (area between two rivers), Jech, Rechna and Bari. The six canals in a way support each other and form a single system. Two of them in fact are linked together over the Ravi, forming the Triple Project. But now only the *Upper Bari Doab Canal* lies partly in India.

This canal rises from Ravi at Madhopur headworks, and except its tail ends going towards Lahore and Kasur, lies mainly in India. It is the first canal dug under the British rule, and

started working in 1859 A.D. Its main lines are 324 miles long, and it irrigates one quarter million acres.

River Sutlej enters Pakistan Territory in Bahawalpur State below Ferozepur. In this stretch at Gandasingh Wala near Ferozepur, canals are taken out from both banks, the right bank canal going to Pakistan and the left bank one to India, covering the Bikaner area.

The old classification of canals namely *perennial* and *inundation canals* is gradually losing importance as the latter are being slowly converted to perennial canals.

Sirhind Canal: Work started on this canal in 1873. It is taken out at Rupar from the Sutlej. It mainly irrigates the Patiala and East Punjab States Union.

Western Jamuna Canal irrigates 855,000 acres in the eastern districts of Punjab. It is a very old canal and was built by Feroze Shah in the 14th century. In 1626 it was repaired by Ali Mardan Khan, the great engineer of Shah Jehan. It was renovated by the British in 1873, when the new Tajwala Head was built.

Canals of Uttar Pradesh

Eastern Jamuna Canal was also constructed by the Mogul Kings and was renovated by the British in 1830, who built the headworks at Naushera. It irrigates 400,000 acres in Western U. P., and is a highly remunerative undertaking.

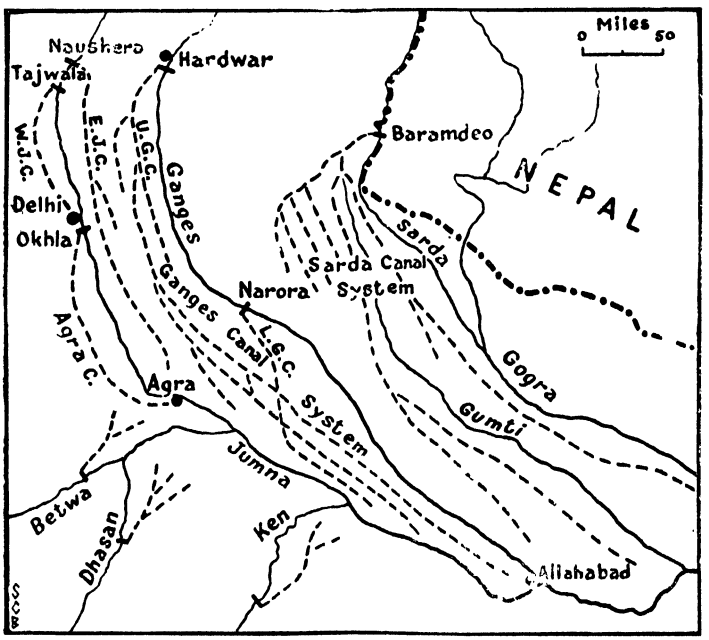
The Upper and Lower Ganges Canals irrigate the doab between Ganges and Jamuna. Work was started on it by Cautley in 1842. The Upper Ganges Canal starts from the headworks near Hardwar and crosses the Solani River by the biggest aqueduct in India, near Roorkee. The Lower Ganges Canal takes off at Narora and joins the tail ends of the Upper Ganges Canal. The two together irrigate 2½ million acres and contain 7,800 miles of channels, forming the biggest system in India.

Agra Canal takes off from Jamuna at Okhla near Delhi. It irrigates 350,000 acres in Mathura and Agra Districts.

Sarda Canal irrigates 1.47 million acres of land between the Ganges and Gogra. It takes out from the latter at Baramdeo on the Nepal border. It has four main branches two of them extending to Fyzabad and Allahabad. It is the second largest system of U. P.

Trans-Jamuna Protective Canals: These canals were built as protective measures, to cope with famines, with the knowledge

that they will not yield cash dividend. But by successfully keeping the famine at bay they have served their purpose well. Canals taken out from Betwa, Dhasan and Ken rivers are important among them.



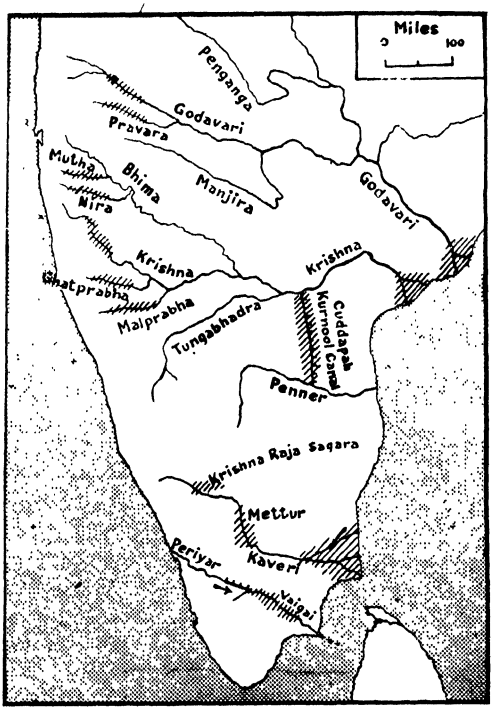
Map 18
Uttar Pradesh Canal System.

Canals of the Deccan Plateau

The Delta systems: (a) *Kaveri Delta Canal*: As river deltas are covered by fertile alluvium, the important systems of canals in Deccan are found in the deltas, where they are very remunerative. The Kaveri Delta Canal is said to be the oldest in India. A grand *annicut* (barrage) was built across the river at the head of the delta in the second century. A new barrage was built in 1936, complete with sluice gates. The system now commands one million acres in the rich rice producing lands of the delta.

(b) *Krishna Delta Canals*: A barrage has been built across the river near Bezwada, from where canals go down on both sides of the river. They irrigate nearly one million acres of the delta land.

(c) *Godavari Delta Canal*: A dam in four parts is built across the two branches of the river, Gautami and Vasistha, taking advantage of two islands in the river. At Dowlaishwaram aqueducts carry canal water into the Nagaram Island between the two branches. Nearly one and a quarter million acres of land is benefited. A special crop grown here is Virginia Tobacco.



Irrigation in Deccan (Irrigated areas are shaded)—Map 19

Besides the three delta projects mentioned there are other smaller delta projects such as in Rushikulya and Tamraparni.

Headwater Projects—A number of small projects combining hydro-electric power production and irrigation have been built in the Western Ghats at the sources of Godavari, Krishna and their tributaries. The sources of the following rivers have been tapped (i) Godavari near Nasik (ii) Pravara, a branch of Godavari, (iii) Bhima, (iv) Mutha and (v) Nira near Poona, all affluents of Krishna, (vi) Krishna itself, (vii) Ghatprabha and (viii) Malprabha, two more tributaries of Krishna.

Kurnool-Cuddapah System joins Tungabhadra and Penner. This was a failure in two respects. Firstly the cost of building it far exceeded the estimate and secondly the infertile soils did not produce the desired benefits. So it resulted in an economic loss. Many other contemplated projects on the plateau were abandoned after this failure.

Periyar Project: The aim of this project was to divert the water of the rainy western slopes of Cardamom Hills to the dry rainshadow area to the east. For this purpose a 173 feet high dam was built at an altitude of 3,000 feet in the hills across the Periyar river draining to the Arabian Sea. The water of the reservoir was then led by a 5,700 feet long tunnel pierced through the hills to their eastern face. The water was then taken by the Vaigai river to the Madura plains for irrigation. The project is the only one of its kind in India.

Canals of West Bengal: Two small canals were constructed here, the Damodar Canal, and the Eden Canal. Together they irrigate only 186,000 acres partially, for their headworks do not allow sufficient storage for perennial irrigation. They will be converted to perennial canals and enlarged when the Damodar Valley Project is completed.

State distribution of area under canal irrigation. The following table gives the total area sown, and area irrigated by canals in thousand acres in 1946-47:—

State	*Total area Sown*	*By Govt. canals*
Punjab (East)	14,283	2,761
Madras	36,440	4,166
U. P.	46,298	4,267
Bihar	23,109	683
Orissa	7,563	390
Bombay	29,373	354
W. Bengal	12,701	279
Delhi	222	27
Assam	5,976	2

The total area irrigated by Government canals in India in 1946-47 was 12,931,860 acres. Area irrigated by tanks was 6,603,751 of which 3,415,329 acres was in Madras. Wells irrigated 10,621,006 acres in the same year, the state of U. P. heading the list with 5,142,312 acres.

CHAPTER—VI

MULTIPURPOSE PROJECTS

Previous methods of constructing dams or barrages across rivers for the single purpose of storing water and feeding canals from the reservoir for irrigation is being gradually discarded. Such single-purpose projects are the canal projects described in the previous chapter. Other projects entail construction of dams on rivers in hilly regions, creating a high level reservoir and then dropping water through pipes for producing electric power. Some such single-purpose projects will be described in the next chapter. Thus projects in the past had one purpose, either irrigation or hydro-electric power generation. Lately some projects were completed for a double purpose, such as the Mettur project for hydro-electric power as well as irrigation.

At present many projects are being planned to serve a large number of purposes. They aim to control complete river basins, to get full benefit from the river water. These projects are termed multi-purpose projects. Some other countries have already successfully completed multi-purpose projects. Of them the most important is that of Tennesse River, popularly known as the T. V. A.* The Government of India proposes to copy the T. V. A. for completing her own projects of which Damodar and Mahanadi projects will be taken up first.

Damodar Valley Project**

River Damodar rises from the 3,504 feet high peak named Khamarpat in Palamau District, near Tori railway station on the Barkakana-Daltonganj line. With its chief tributaries Barakar, Jamunia, Konar and Bokaro it drains nearly 7,000 square miles of the eastern part of the Chotanagpur Plateau. After its confluence with Barakar it enters W. Bengal. Here its valley is a 20 mile wide strip, first running eastward, and then suddenly bending southwards below Burdwan town. It finally falls in river

* T. V. A. stands for Tennesse Valley Authority, an organisation which controls the project and administers the valley basin in U.S.A.

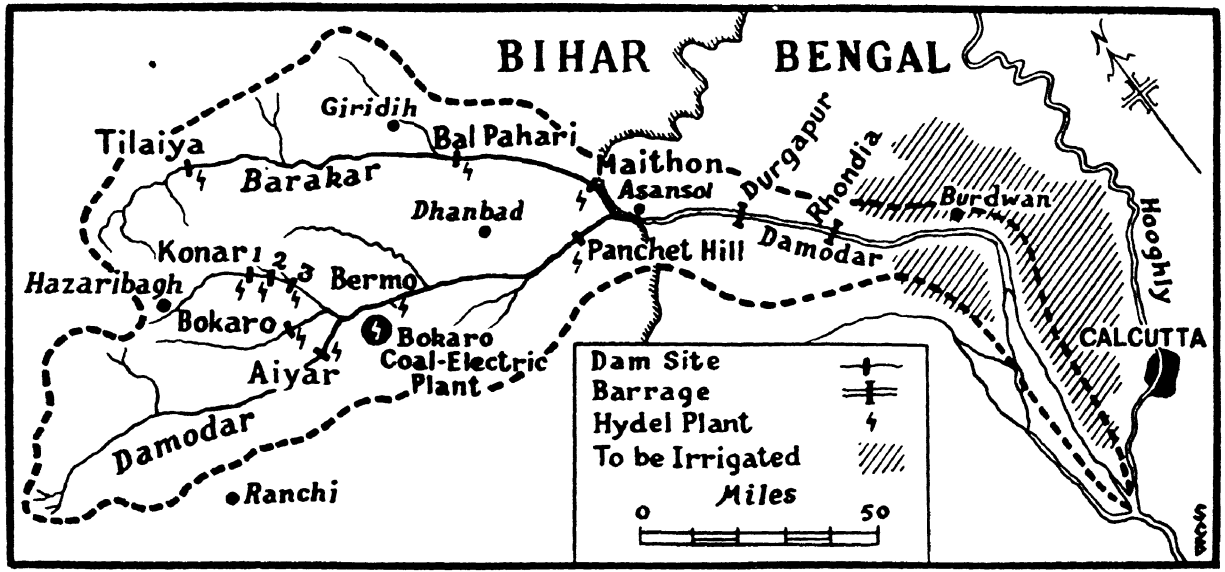
** Damodar Valley Project by S. C. Bose.

Hooghly opposite Falta, a few miles below Calcutta. The area of the valley in Bengal is nearly 2,000 square miles (if the area adjacent to the valley to its east is also included). The 7,000 square miles of the plateau land are badly eroded.* Excess of sand and silt is carried by the river and is deposited in its lower course, where the river bed is choked by sand, and has very little capacity of carrying flood water. On the other hand excessive run off of rain water, due to soil erosion, causes quick flooding of the river after heavy continuous downpours. The normal high flood discharge of Damodar at Rhondia above Burdwan is 250,000 cusecs, and in high floods of 1913 and 1943 it rose to 650,000 cusecs. The carrying capacity of the river mouth is only 50,000 cusecs. Flooding of adjacent land is therefore obvious. The left bank is protected by a huge embankment, but even this is torn by floods now and then. The right bank is left to the mercy of floods year after year. The Damodar and Eden canals are partial failures due to the drying up of the river in the winter.

The multipurpose project has been planned to remove these troubles as well as produce electric power. The project envisages the construction of ten dams with attached power stations at various points in the plateau area in Bihar and a barrage (another barrage already exists at Rhondia). The following table gives some details about the dams:—

	River	*Dam site*	*Power produced in kw.*
1.	Damodar	Aiyar	45,000
2.	,,	Bermo	28,000
3.	,,	Panchet Hill	40,000
4.	Konar	I	20,000
5.	,,	II	11,000
6.	,,	III	11,000
7.	Bokaro	—	3,200
8.	Barakar	Tilaiya	8,000
9.	,,	Bal Pahari	20,000
10.	,,	Maithon	40,000
		Total	226,200

* Soil Erosion in Damodar Valley by S. C. Bose; Science and Culture Aug. 1946.



Map 20

Main features of the Damodar Valley Project.

Total storage behind these dams will be 4,700,000 acre feet. This will allow (a) Production of 226,200 kw. of electric power (b) Controlling floods in the lower valley by holding water of rain storms (c) Supply of perennial irrigation water to nearly 1,000,000 acres in W. Bengal. (Burdwan, Bankura, Hooghly and Howrah Districts. This will include the present partially irrigated area.) (d) Regulation of water flow to 3,000 cusecs minimum all the year round to supply municipal water (e) Navigation in the lower valley (f) Fish culture in the lakes formed, and in the rivers and canals (g) Recreational facilities, such as boating, swimming, angling etc. For irrigation purposes a new barrage is proposed to be built at Durgapur, from where canals will be taken out on both sides. The canal on the north side will join up with the present Damodar canal system which is taken out at the Rhondia barrage. The main canal here will join Damodar with Hooghly, from Durgapur to a point opposite Kanchrapara. It will be navigable.

A stand-by thermal electric plant with a generating capacity of 150,000 kw. will be built at Bermo. The electricity produced will be finally linked up with Calcutta, Jamshedpur and other points in Bihar, creating a huge grid system.

If the project succeeds, it will be really a multipurpose project in the true sense of the word. However it is felt that very meagre data is available to plan such a project. Lack of correct and sufficient data may prove to be a stumbling block. Much of the plan is still tentative and further changes may take place in the number and position of dam sites. Construction has started on the Tilaiya dam on Barakar and one of the three Konar dams. Work has also started for the erection of the big thermal electric plant at Bermo, the money being provided by the World Bank as a loan. It may be noted that Tilaiya and Konar—I will cover only a very small part of the Damodar catchment, and so will not be able to control floods in the lower basin. The period required for the completion of the whole project will depend on the availability of funds. Work will also begin at Maithon and Panchet Hill dam sites in near future. Simultaneously work will start at the Durgapur barrage site together with the digging of canals. Provision has also been made for soil conservation and rehabilitation of those whose lands will be submerged in water

reservoirs. A model village is being planned for this purpose near Tilaiya.

Complete soil erosion control is also needed. Soil erosion is the root cause of all trouble and without stamping out this evil the prosperity of the project will be short lived. The total cost of the project will be about Rs. 55 crores, according to earlier estimates.

By an Act of the Indian Parliament a Damodar Valley Corporation (D. V. C.) has been set up, with three members, with wide powers to ensure a unified development of the valley.

Mahanadi Project

To some extent this project resembles the Damodar Valley Project, only it is a far bigger affair. The Mahanadi basin is more than six times the area of the Damodar basin being 51,000 sq. miles. The flood discharge is about 1.6 million cusecs. The full scheme tentatively proposes to build dams across the tributaries *Tel, Ib, Mand, Ong, Hasdo, Jonk and Hamp.* But initial work will begin on the main Mahanadi river on three dams at *Hirakud, Tikkerpara* and *Naraj.* At the first instance work has begun on the Hirakud dam. Tikkerpara and Naraj dams will be constructed only after its completion. Hirakud project envisages the construction of a 3½ mile-long dam and a reservoir capable of storing nearly five million acre-feet of water nine miles upstream from Sambalpur.

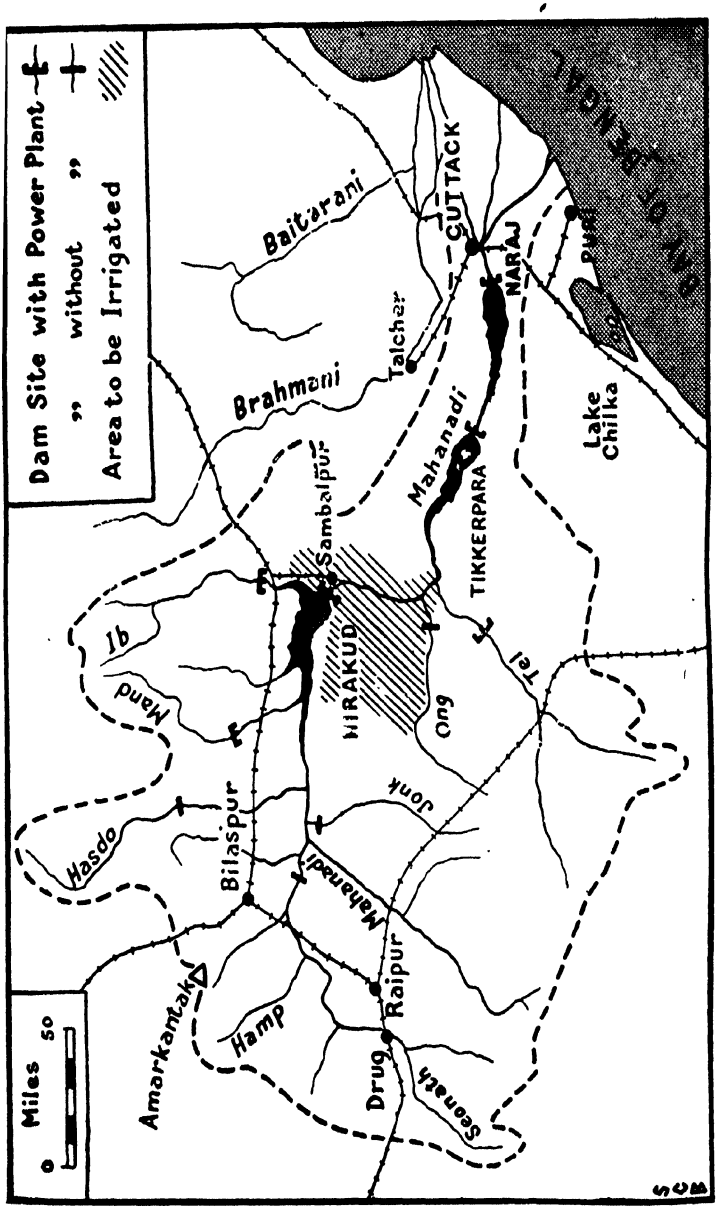
Canals will take off from the dam on either side of the river and irrigate 1.1 million acres in the district of Sambalpur and adjoining areas, resulting in an increase in the output of food crops by 350,000 tons per year.

There will be two power houses, one at the main dam and the other 12 miles down. They will generate three million kilowatts of power.

The scheme, when completed, will also afford protection to the delta area of Orissa from floods.

With the extensive mineral and forest resources of Orissa, the project will help the fulfilment of great industrial possibilities in the area.

While the entire project may cost Rs. 47.5 crores, its essential part which may be completed within a period of six or seven years, is expected to cost Rs. 30 crores.



Map 21

Mahanadi Basin, with main features of the Project.

When completed the project will provide navigation facilities from the top of the Hirakud Lake to the sea, a distance of 300 miles.

The Bhakra and Nangal Projects

These projects aim at the multi-purpose utilization of the waters of river Sutlej. A dam 680 feet high will be built across the river at Bhakra, and the water of the river will be diverted through two tunnels of 50 feet diameter each. The lake behind the dam will be 50 miles long, and will submerge the old town of Bilaspur with its temple. Eight miles below Bhakra another dam 100 feet high will be built across the river at Nangal. In all 6.5 million acres of land will be irrigated, of which 4 will be in Punjab, 1.5 in PEPSU and 1 in Bikaner. An additional 1.3 m tons of food grains and 8 lakh bales of long staple cotton are expected to be produced. The scheme will cost Rs. 130 crores and will be finished in 1956. At present half of the dam at Nangal has been built, and the whole of it will be completed by the end of 1950. A road and a railway will be carried over it connecting Ambala and Hoshiarpur. At Bhakra the two tunnels have been constructed, connecting Rupar and Bhakra. The scheme will produce 400,000 kw of electricity, and this power will be utilized for the industrialization of the region. But at present it seems, that it will be difficult to consume all the power generated. No mineral resources have yet been found in the area, which may lead to industrial expansion. The power will be distributed in Punjab, Delhi and eastern U. P. It will be also used to develop cottage industry.

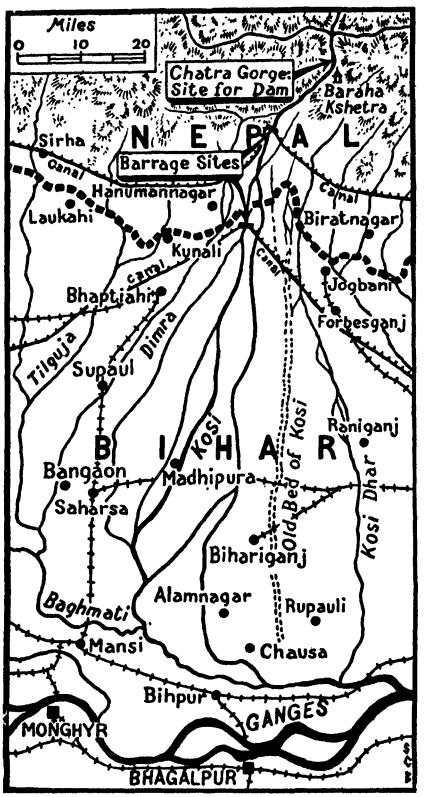
Kosi Project

Kosi is the third biggest Himalayan river, being only next to Indus and Brahmaputra. Its basin in the Himalayas is 24,000 sq. miles of which 2,200 sq. miles is under glaciers. Here rise World's highest peaks, Mt. Everest and Kinchinjunga.

During the last 200 years Kosi has moved 70 miles westwards in the plains. In doing so it has laid waste nearly 3,000 square miles. The river is subject to sudden floods rising over 30 feet in 24 hrs. and becoming 20 miles broad at places. Its upper basin in Nepal is badly eroded.

The Kosi Project is designed to prevent floods and usefully utilize the water. The project will comprise the following :-

(a) A dam, 750 feet high, across Chatra Gorge in Nepal near Baraha Kshetra temple. Beating the Boulder Dam on River Colorado in the U.S.A. by 22 feet, it will be the highest in the World.



Map 22

Kosi Project.

(b) 1.8 million kw. of electric power will be generated.

(c) A barrage in Nepal, providing irrigation to one million acres in Nepal.

(d) A barrage in Bihar, providing irrigation to 2 million acres in Bihar.

(e) Measures for soil erosion control, drainage of marshes, malaria control, fish culture and recreational facilities.

(f) Navigation in Kosi. This will make navigation possible from Calcutta to very near Khatmandu.

The project will cost nearly 90 crores of rupees. The Government took a long time to decide, whether to embark on the project or not. Recently it decided to proceed with it in stages. The first stage, which will cost Rs. 10 crores, consists of the building of a barrage at Chatra, with a road bridge across Kosi. A major canal will be taken out from here to the east. A hydel plant, producing 20,000 kw. of electricity will be located on the canal six miles below Chatra. About 20,000 acres of land will be irrigated.

Son Valley Project

The Son river drains an area of 23,000 sq. miles in Rewa (Vindhya Pradesh), U. P. and Bihar. A multi-purposes scheme for the valley is under preparation.

In the first stage it was proposed to construct a dam on the Rihand tributary of the Son at Pipri, by the U. P. Government. The work on it has, however, been given up for the present.

Tista Project

It envisaged the construction of a high dam below Kalimpong and a barrage further down producing 300,000 kw. power and irrigating 4 million acres of land, but its execution has been held up due to the partition of Bengal. It can only be completed now after proper agreement on the matter between India and Pakistan.

Chambal Basin Project.

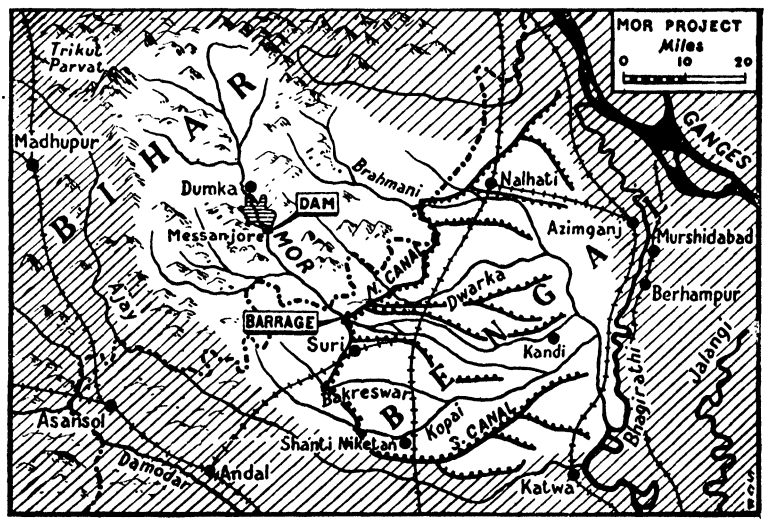
Chambal is a tributary of Jamuna and drains 55,000 sq. miles of Madhya Bharat. A preliminary scheme has been drawn up for its multi-purpose development by CWINC (Central Water ways Irrigation and Navigation Commission). The creation of Madhya Bharat will go a long way in solving administrative difficulties.

Narbada and Tapti Multi-purpose Development.

The two rivers drain 68,000 sq. miles of the central part of India. CWINC is preparing a scheme for flood control, irrigation, navigation and power generation. When complete it will be the biggest project in India.

The Mor Project.

Under this scheme a dam will be built on the Mor river at Messanjore in Bihar. A barrage will be built in the Birbhum District of W. Bengal at Tilpara near Suri. The barrage is expected to be completed by 1951. Four smaller barrages will be built across Brahmani, Dwarka, Bakreswar and Kopai. 100,000 acres will come under irrigation in 1952. The whole project will be completed by 1954, when 600,000 acres will come under



Map 23
Mayurakshi (Mor) Project.

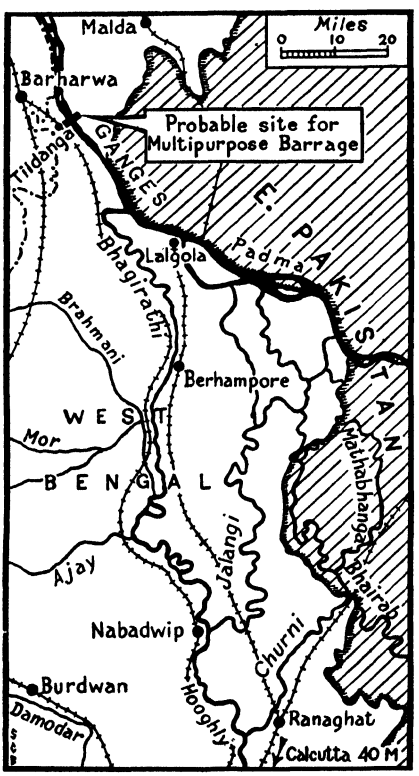
irrigation. Some 4,000 kw of electricity will be produced at Messanjore. The yield of paddy in Birbhum will be increased by about 300,000 tons. 50,000 tons of rabi crops will also be grown. According to recent estimates the total cost of the project will be Rs. 15 crores.

Ramapada Sagara Project.

A huge dam will be built across the river Godavari in Madras above its delta. It will irrigate 600,000 acres of land in addition to the present delta irrigation system. 75,000 kw of hydel power will be generated at the dam site. This project has not yet received the sanction of the Government.

Sangameswaram Project.

This project, which will cost Rs. 78 crores to the Madras Government and take more than seven years to build, is mainly meant for irrigating 2½ million acres in the Kurnool, Cuddapah, Nellore, Chingleput and South Arcot Districts. The project envisages the construction of a dam across the Krishna river at Sangameswaram, just below its confluence with Tungabhadra. A cut will be taken out from the reservoir to join up with the Cuddapah-Kurnool Canal, which will lead the waters of Krishna



Map 24

Ganges Multi-purpose Barrage.

to the Penner. A few miles below this point a dam will be built at Someswaram. From this reservoir canals will be taken out on both sides of Penner.

Tungabhadra Project.

Its construction is being taken up jointly by Madras and Hyderabad. Its main feature is a concrete dam across Tungabhadra. The dam will impound 2.6 million acre-feet of water which will be drawn in equal quantity by Madras and Hyderabad. The total area to be irrigated in Madras will be 300,000 acres of which 36,000 will be under wet garden crop. In addition Madras will also generate a small quantity of hydro-electric power. The cost of the project to Madras will be Rs. 10 crores. Work on it is progressing satisfactorily.

Marora Project.

It consists of the construction of a 190 feet high dam on river Nayar, a tributary of river Ganges, about 57 miles upstream from Hardwar in U. P. 232,000 kw of hydroelectric power will be produced and about 38,000 acres of land will be irrigated. The cost is estimated at Rs. 27 crores. The scheme is yet under consideration.

Ganges Multipurpose Barrage.

This project was proposed by the W. Bengal Government. Preliminary survey is being carried out. The project consists of a huge barrage across Padma (Ganges) the broadest river of India. A road and railway line will pass over it, providing the much needed link between the northern and southern parts of the Province. It will divert water into Bhagirathi-Hooghly and other dying rivers of this area, such as Jalangi and Churni. It will make an all-year navigation possible from Calcutta to Patna. It will also irrigate land in Nadia and Murshidabad. With more water in Hooghly, it will materially help the Calcutta Port.

CHAPTER—VII

HYDRO-ELECTRIC POWER

The geographical factors which condition the development of hydro-electric power generation are topography, rainfall and the run-off from a catchment. The configuration of the ground determines the possibilities of a good site. Himalayas with vast areas of perpetual snow feeding the rivers by glaciers act as infinitely larger reservoirs than any that could be constructed by an engineer.*

An important characteristic of the rainfall of India is its unequal distribution throughout the seasons, the greater part falling from June to October. Consequently, the volume of water in the rivers varies considerably during the different seasons of the year.

The reliability of rainfall is of greater significance than the actual amount of rainfall itself. The variations from year to year are considerable and relatively greater where the fall is small, than where it is heavier.* *

In order to keep the hydro-electric plant working throughout the year, the usually adopted device is to store the excess monsoon water in a reservoir and let it out by a regulating sluice gate so as to give a uniform continuous discharge throughout the year. This increases the cost of production of hydel power.

Fortunately, except in Himalayas above the snow line, there is no fear of the water freezing and stopping power production.

The potentially rich areas are Punjab, Uttar Pradesh, Bombay, West Bengal, Bihar and Assam, while Madras, Hyderabad and Madhya Pradesh have distinctly poorer resources. Madhya Bharat and Rajasthan are the worst.

The total capacity of electrical power installations in India is estimated at above one million kw including the major hydro-

* George Kuriyan, Hydro-Electric power in India, pp. 9.

** Indian Meteorological Memoirs, Vol. III, pages 15 and 255.

electric and thermal stations and a large number of small diesel or other types of small installations. In comparison the total installed electrical power in the U. S. A. is 46 million kw.

In the year 1919, the Government of India inaugurated the scheme of hydro-electric survey of the country and a report was prepared and published in 1921 by Mr. Mears. The time at Mr. Mears' disposal was short, and he had no trained assistants or instruments of survey and observation. The document is not so much a report on survey, but rather of the nature of an intelligent guess.* According to it the maximum potential hydro-electric power in India is about 12 million kw. A later estimate in the Bombay Plan put it at 27 million kw. An estimate by the Geological Survey of U. S. A. gave it as 25 million kw. But most probably it is more than any of these estimates. The total hydro-electric power developed is about half million kw, or only two percent of the potential power.

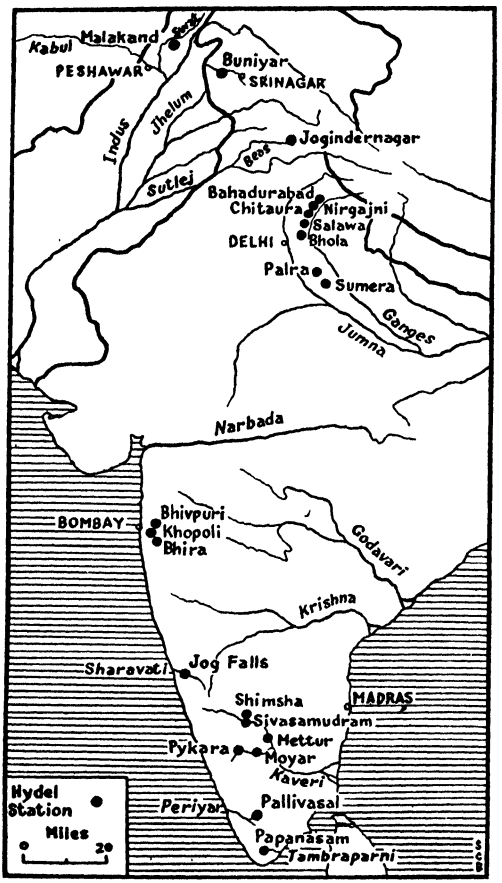
Progress of Power Development

The earliest development of hydel power was in Mysore, where the Sivasamudram Falls on the Kaveri were harnessed in 1902 with a block of 5,000 kw which has gradually increased to its present capacity of about 50,000 kw. It supplied power to the Kolar Gold mines. It recently gave power for the construction of the 120,000 kw plant at Jog Falls on Sharavati river.

The firm of the Tatas pioneered hydro-electric development in Bombay Province, and opened their first hydro-electric station in 1915 (Tata Hydro Power Co.) at Khopoli, utilizing monsoon water on the Western Ghats. It had an installed capacity of 48,000 kw. In a few years, as the demand increased, a second one the Andhra Valley Power Supply Co. was started in 1922, with another 48,000 kw at Bhivpuri. In 1927 the third power station, (Tata Power Co.) was put into service at Bhira with an installed capacity 87,000 kw and the total capacity of all the Tata plants stood at 183,500 kw. They supply power to the important cotton textile industry in Bombay, to the railways (run

* B. K. R. Prasad, Power development in India, Science and Culture Vol. XI, No. 12, pp. 654.

by electricity between Bombay V. T. and Poona on the G. I. P. and the Bombay Subarban lines of the B. B. & C. I. starting from Church Gate) and to the various needs of the municipality of the city of Bombay and domestic use by the citizens. By the



Map 25
Hydro-electric Power.

use of electric power in and around Bombay, it has been possible to largely restrict the import of coal to this area. Previously Bombay imported coal from South Africa, the Damodar Valley coal fields being far away.

The three states of Madras, U. P. and the Punjab made vigorous investigations of their power resources. The Pykara scheme of Madras, which started with an initial capacity of about 15,000 kw has now developed into a major power station of about 39,000 kw followed by another irrigation-cum-electrical project at Mettur, which started early in 1937 with a capacity of 30,000 kw. The water from Pykara river will be further tapped at Moyar producing 20,000 kw. In the extreme south, the Papanasam scheme with an installed capacity of 21,000 kw was put into service in 1944 and is going to be extended to a capacity of 28,000 kw. The Madras projects are connected together in a grid, and supply power to various industries including the cotton textile industries at Coimbatore.

In Punjab, the Uhl river a tributary of the Beas was harnessed with great difficulty and at a very great cost. The initial capacity of the station at Jogindernagar of 48,000 kw is now gradually being loaded up.

In the U. P. seven artificial water falls in the Upper Ganges canal have been utilized to produce hydro-electric power. The falls are at Bahadurabad, Nirgajni, Chitaura, Salawa, Bhola, Palra and Sumera. The total hydel power generated is 19,000 kw. A stand-by thermal electric plant with a capacity of 29,000 kw at Chandausi is connected with the seven stations in a grid. The power is used to raise sub-soil water by electric tube-wells for irrigation, and for domestic use in villages.

In Kashmir, the Jhelum was harnessed near Buniyar as early as 1907. The power house was built for generating 15,000 kw. Travancore has made a good beginning by developing a high head plant at Pallivasal with an initial capacity of about 15,000 kw which is gradually being increased and may reach 50,000 kw shortly and about 100,000 kw in course of time.

A huge program for harnessing our great potential hydel power lies ahead. An idea of it has been given in the previous chapter.

The following table gives the installed and ultimate capacity of hydro-electric plants in India :—

State	*Power Station*	*Installed capacity .000 k.w.*	*Ultimate capacity .000 k.w.*
Bombay	Bhira	88	106
Do.	Bhivpuri	48	68
Do.	Khopoli	48	48
Madras	Pykara	40	50
Do.	Mettur	42	42
Do.	Papanasam	18	25
Do.	Moyar	—	20
Mysore	Sivasamudram	45	45
Do.	Shimsha	16	16
Do.	Jog Falls	48	120
Travancore	Pallivasal	21	36
U. P.	Ganges Canal Grid	19	23
E. Punjab	Jogindernagar	48	72
Kashmir	Buniyar	5	15
	Total for India	486	686

CHAPTER—VIII

AGRICULTURE (General)

With nearly two third of her population, directly or indirectly engaged in agricultural pursuits, or its offshoots, India may be said to be primarily an agricultural country. Though India does not export food since the great famine of 1943, yet it does export much of agricultural produce in the shape of jute, tea, oil seeds and cotton products. Thus the Indian budget is much controlled by agricultural conditions prevailing for the year in question. Inspite of such a great importance of agriculture for the prosperity of the country two facts stand out inexplicably, (a) firstly India has become a regular importer of food—she has been importing nearly three million tons of food grains from abroad, and she wanted more; (b) compared to other advanced countries the yield of practically every crop she raises is any thing from half to one-fifth of such countries. Answers to the above two facts will answer many problems related to Indian agriculture.

To understand agricultural conditions in India the following points may be noted:—

(1) The dominating economic factor in Indian agriculture, which follows from the great density of population, specially in fertile parts of the country, is the *smallness of the holdings and their fragmental character.* The peculiar laws of inheritance prevailing in the country are also responsible for this state of affairs. The effect of small and scattered holdings on agriculture is disastrous. It forces the farmer, so to say, to stick to primitive methods of agriculture. It is out of question to use mechanical contrivances, such as tractors or combined harvesters in puny, little fields. The power used is invariably a pair of work bullocks. Even the movement of meagre implements and bullocks from one little field to another by a farmer is tedious. It also becomes very difficult to keep the purity of a good quality crop, for cross-pollination from an adjacent field is sure to damage purity. This

is specially so in the case of cotton cultivation. Collective farming on a co-operative basis seems to be the only remedy to remove the handicap of small holdings. The buying of all agricultural land by the Government and then redistributing in large holdings, is another way out of the trouble, but insurmountable administrative difficulties stand in the way of such a procedure.

(2) *The general poverty, illiteracy and conservative attitude* of the farmer holds back any advancement on modern lines. But to the credit of the farmer it may be said that he has a great aptitude of learning new methods, and his skill, is sometimes astounding. He can predict the future condition of his crop, as if by instinct, and knows more about weather forecasting by mere observation, than a skilled meteorologist, who can work only by his instruments. The farmer has however a pessimistic outlook generally. He is a very hard worker, and can work miracles if the rain comes at the right time. The poverty of the farmer will be removed only when the general standard of living rises in India. He is yet in the clutches of the money lender. The co-operative movement has made only a little headway.

(3) *Cultivating implements* are few and simple. In the alluvial areas a simple wooden plough with an iron or steel point for soil stirring is the main requirement, and is supplemented by a heavy wooden beam in the middle, which serves the combined purpose of roller, clod crusher and soil compacter. * With these two simple implements the cultivator of dry regions is able to carry out soil-moisture conserving operations, with a precision which proves that dry farming was well known in India, before it was "discovered" in America. But these implements make an excessive demand on the limited bullock power and are not equally efficient for all purposes. In consequence the small iron plough is gaining in popularity, and the number of them now in use in India runs into hundreds of thousands. Other implements which in various areas have now become important are various simple types of harrow and cultivator, which are mainly of value in permitting timely work on the land and the intercultivation of crops in brief intervals between the monsoon downpours.

* B. C. Burt, Agriculture and animal husbandry in India: Field Sciences of India, pp. 145.

(4) *Modern agricultural machinery* is now being imported in small numbers. 462 tractors were bought from U.S.A. in the past three years. 375 heavy tractors were also expected to be received by the end of 1950. In 1947-48 tractors reclaimed 32,500 acres of land and in the next year 73,000 acres, bringing the total to over one lakh. The new tractors purchased will reclaim 10 acres of weed infested land or 4 acres of jungle land per day. Perhaps a good suggestion will be not to ape the U. S. A., but to invent new types of light tractors to suit Indian conditions, and produce them in bulk in India.

Bullocks are yet the power behind the plough. They plough, they draw water from wells, they transport material, crush oil seeds and sugarcane, and help in threshing the corn. It will take a long time before they are eliminated from the agricultural scene in India.

However progress of land reclamation by the use of machinery continues. The success achieved in this direction through tractors supplied by the Central Tractor Organization of the Indian Ministry of Agriculture, is reflected in the increased demands for these machines which are being received from the States.

The scope of using harvesters and threshers is understood to be receiving the attention of the Government. For the successful application of mechanical cultivation in any country holdings must be sufficiently large to permit tractors to be economically employed. The minimum area on which a 25 to 30 h.p. tractor can be economically used is 150 to 200 acres, and for full value to be obtained from a tractor it must be used at least 1,800 hours in a year. To work 1,800 hours a year an area of 150 to 200 acres must have a rotation of crops, and if there is to be a rotation of crops, there must be an assured supply of water.

The estimates of the Department are that it may not be possible to reclaim more than 6 m acres in five to six years. The preliminary survey cannot be carried out at more than 2 m acres per annum. This in itself will limit the speed with which land reclamation can be undertaken. If it is decided to accept the target of 6 m acres for reclamation it will be necessary to purchase an additional 1,000 machines.

The initial ploughing and harrowing of reclaimed land must be followed by normal cultivation. In the areas to be reclaimed

there is a serious lack of bullock power. If the follow-up cultivation is to be done by mechanical methods 30,000 tractors of 25 to 30 h.p. with complete outfits such as ploughs, cultivators and harrows, will be required. If, therefore, Government plans are formulated in the light of the recommendations of the Foodgrains Policy Committee it will open up possibilities for mechanical cultivation on a fairly large scale.

Apart from schemes which the Government may undertake, the demand of individual cultivators possessing large holdings is not inconsiderable. The total number of tractors in working condition with individual cultivators was estimated at nearly 5,000, and it is not the policy of Government to discourage individual cultivators in mechanical cultivation.

The whole policy regarding the importation and distribution of tractors and agricultural machinery was reviewed by the Government, and it was decided that all reasonable requests for imports of standard agricultural machinery which has proved its utility under Indian condition should be allowed.

There has been another development which makes mechanical cultivation in certain parts of the country not only desirable but necessary. The migration of population between Pakistan and India after the partition left large tracts of agricultural land uncultivated in previous years. One such case is the territory of Bharatpur and Alwar, where about 400,000 acres of good argicultural land was left by the Meos. Not a single head of cattle is visible on this large stretch of land.

The Goverment of India decided to settle refugees there, to first plough and harrow the land by tractors, to be followed by cultivation by bullock power by the refugees later. There are other similar areas where mechanical cultivation will be necessary.

The possibilities of mechanical cultivation in India, therefore, lie in the following directions:—

(1) Reclamation of land now covered with scrub jungle.

(2) Reclamation of land from weeds.

(3) Mechanical cultivation in large farms owned by individual cultivators.

(4) Mechanical cultivation in the earlier stages in large blocks of land vacated by migrating populations.

The areas involved will run into 15 m or 16 m acres and will require more than 40,000 heavy and medium tractors within the next few years. While the possibilities for mechanical cultivation are thus considerable, the important factor must be recognized that tractors cannot replace bullocks in this country.*

(5) *Manures and fertilizers* are used very sparingly, when compared to foreign standards of agriculture. Firstly the farmer is too poor to use them, and secondly they are in short supply. The unfortunate practice of using cow-dung as a fuel continues. It is not due to the lack of the farmers' knowledge of its high manurial value, but to sheer want of fuel. The removal of forest to give way to agriculture has created a scarcity of firewood. Its import from distant places is impraticable, due to its cheapness and bulky nature, and lack of communication. Local supply of firewood can be made if villages keep small groves of trees for this purpose, as a co-operative property. Tree-planting weeks have been held in India, and much is being done to popularize tree cultivation, for herein lies the remedy to save cow-dung for manuring. *Vanamahotsav* was celeberated again in July, 1950.

Export of oil cakes, oil seeds and bones also means a continuous depletion of our soil. These commodities which owe their origin to the soil must return back to it, to help maintain its fertility. Castor cake which is produced in large quantities is used as a manure, and its use should increase further. Bones are rich phosphatic manures. Their use is rare. They should form a base for manufacturing superphosphates. Slowly the value of composting is being appreciated. In some places the value of green manure is also well known.

As to mineral fertilizers, their use is mainly confined to tea and coffee plantations. The total quantity of ammonium sulphate and sodium nitrate (Chile saltpetre) used in India as manure is about 60,000 tons. About 14,000 tons of phosphatic manures and 4,000 tons of potash manures are imported. The use of ammonium sulphate and oil cake is on the increase. The present production of ammonium sulphate is restricted to the Alwaye factory in Travancore where forest wood is used to produce ammonia by wood distillation. The construction of a huge Government plant

* Special article in The Statesman of July 27, 1948, by B. R. Sen, Agricultural Secretary, Government of India.

at Sindri in Jharia for manufacture of ammonium sulphate as a by-product in the process of making coke, may be noted in this respect. The use of gypsum as a substitute for sulphur, may solve the problem of import of sulphur from U. S. A., Italy and Japan. Even this plant, when working fully, will supply a small part of the great need of India. Fixation of nitrogen from air will be possible only when our dreams of the various multipurpose projects and hydroelectric power production come true.

Land Use Statistics:

The total area of the Indian Republic is 558 million acres of which 242 million acres are actually cultivated.

The following table gives land-use statistics in million acres for the states for 1946-47:—

State	(*Cultivated*) *Net area actually sown.*	*Current fallow.*	(*Uncultivated*) *Cultivable waste other than fallow.*	*Not available for cultivation.*
Assam	5.2	1.5	17.6	4.2
West Bengal	11.2	.9	2.0	3.0
Bihar	17.7	7.1	6.4	6.5
Orissa	6.5	1.2	3.3	6.6
Uttar Pradesh	37.4	2.7	10.0	10.1
Punjab (East)	1.2	1.6	2.4	6.1
Madhya Pradesh	24.2	4.3	13.9	4.8
Bombay	28.3	5.7	.8	6.0
Ajmer	.4	.2	.3	.6
Delhi	.2	.0	.1	.1
Coorg	.2	.2	.0	.4
Madras	31.2	9.4	11.9	14.0
Total	174.4	34.7	68.6	63.0

Reclamation of land:

What kinds of land can be brought under mechanical cultivation without having to interfere unduly with the existing land tenure system? This question was examined by the Food grains Policy Committee, set up by the Government. The committee recommended that the country should set for itself a target of increased food production up to 10 m tons in as short a period.

as possible. Of these 10 m tons they expected 4 m tons to be secured as the result of completion of multi-purpose irrigation and electricity projects, 3 m tons under five year Grow More Food schemes commencing from 1947-48, and the balance of 3 m tons from the reclamation of cultivable lands of all types.

To produce 3 m tons, 9 m to 10 m acres of cultivable waste land will have to be brought under cultivation. Though a proper survey of these areas has not as yet been made, the following rough estimates will not be wide of the mark:—

	Acres.
Punjab	500,000
Uttar Pradesh	1 m
Bihar	200,000
Assam	3 to 4 m
Orissa	1 m
Madhya Pradesh	1 m
Madhya Bharat	1 m
Madras	1 m
Vindhya Pradesh	500,000
Total acres	9 to 10 m.

Apart from these cultivable wastes, there are large areas in India which are covered with weeds. These areas, which are extending every year, are now either entirely out of cultivation, or are producing less and less according to the degree of infestation. Such land can be freed from weeds by deep ploughing which can only be done by heavy tractors. The roots of these weeds, even after deep ploughing, will, however, remain and will come to the surface after five or six years. Deep ploughing operations by tractors will, therefore, have to be repeated in these areas every five years.

Reclamation of land in 1948-49 in various states was:—

Madhya Pradesh	39,247 acres
Uttar Pradesh	20,600 „
Punjab	6,450 „
Madhya Bharat	5,200 „
Delhi	1,756 „

In Uttar Pradesh there are three areas where land reclamation is progressing most satisfactorily. It was first begun in Ganga Khadar where it was very successful. Vast tracts of land are being cleared in Nainital Terai. These two areas collectively aim at retrieving 140,000 acres. Between Ramnagar and Kashipur new refugee colonies are fast growing up. Huge blocks of land, newly cleared and fenced to save them from wild animals are growing their first crops. In swampy areas East Bengal refugees are being settled to cultivate jute. The third important area in U. P. is the kans-infested region in the Trans-Jamuna tract of Jhansi.

In Madhya Pradesh 300 acres of land are being reclaimed daily by 90 tractors at Patharia and Khurai in Saugor district and Piparia and Dularia in Hoshangabad. 11,000 acres were reclaimed in April, 1950.

In Punjab it is proposed to reclaim 100,000 acres every year for five years by the help of 78 heavy tractors to be borrowed from the Central Tractor Organisation. 6,000 acres were reclaimed in Karnal district.

Madras reclaimed 6,000 acres in June 1950. In the same month Bihar reclaimed about 2,500 acres, mainly in Darbhanga.

In West Bengal 250,000 acres will be brought under cultivation in Pakistan border regions. East Bengal refugees will take up this work by the help of 24 tractors.

The Problem of Food Shortage.

Excluding Burma (which was separated in 1935) India (and Pakistan) was for a very long time an importer of food, nearly two million tons of rice, coming usually from Burma. This supply was cut off in 1943, and various other causes combined to produce the great famine of 1943. Since then India has remained an importer of food from abroad. Burma has not yet been able to supply even half of the rice it used to give before 1942. The same is the case with Siam, another rice exporter. Rising prices have made the problem more complicated and India is being forced to lose huge sums of money annually for securing food supplies from abroad.

Population Pressure.

Rising population is said to be one of the causes of food shortage. The rise in the decade 1921-1931 was 10.6 per cent and in the next decade 15.1 per cent. However, this is low when compared to other countries. In the period 1870-1930 percentage rise in population in some countries is given below:—

U. S. A.	125
Russia	115
Japan	113
United Kingdom	77
Germany	60
India	30.6*

Thus many economists believe that rise in population in India is not very much responsible for food shortage. Moreover, the overall density of population in India is nearly 300 per square mile, while, it is nearly 700 in United Kingdom.

Industrialization:

U. K. has met her food shortage by industrialization. India must follow suit. The table gives percentage of three types of occupations for three countries:—

Country	*Agriculture*	*Industry*	*Commerce & Trade*
India	67.1	10.2	22.7
United Kingdom	5.7	45.3	49.0
Japan	50.3	19.3	30.2

The table proves that Japan followed the footsteps of U. K. Why should not India do the same thing?

Poverty of the farmer.

Reference has been made to the great poverty of the Indian farmer, which forces him to employ primitive tools, poor quality seeds and very small quantities of fertilizers. The annual income in India per head is Rs. 65, in U. S. A. it is Rs. 1,806, in Canada Rs. 1,038, in Australia Rs. 980, in Germany Rs. 603 and in Japan Rs. 281.

* Gyan Chand: India Speaking.

Low Yields.

Backward methods of cultivation, resulting from poverty* have led to very low yield in lbs. per acre in India, as the table shows:—

Country	*Wheat*	*Rice*	*Maize*	*Sugarcane*	*Cotton*	*Tobacco*
U. S. A.	812	2185	1579	47,534	268	882
Germany	2017	..	2828	70,302 (beet)	..	2127
Italy	1383	4568	2079	.....	170	1139
Egypt	1918	2998	1891	.....	535	.....
Java	.....	.....	.....	43,270	.....	.....
Japan	1713	3444	1329	.....	196	1665
China	989	2433	1284	11,570	204	1288
India	660	1240	803	14,988	89	987

Nutritional Needs.

Coming to actual supply and consumption we find that even before 1939 Indians were underfed. The available supply of calories per head per day in India was 2,025, while the nutritional target is 3,000. For U. K. the figure was 3,070 and U S. A. 3,240.

Solution of the food problem is exceedingly complex. It has now to be tackled in co-operation with other countries of the world, and thus by an integration of (i) scientific efforts to increase production, with (ii) national and international policies.

Scientific Methods:

Food production must be stepped up by the application of scientific methods. Wherever the land tenure system is prejudicial to this application, it should be drastically over-hauled.** Collectivisation of agriculture is essential for applying modern methods. Proper soil management including prevention of soil erosion, reclamation of waste land, mechanisation of agricultural operations, etc., can give very much larger out-turns of food than at present. It has been roughly estimated that the yields of grain per acre in India could be increased by 30 per cent, in 10 years—5 per cent, by the use of improved varieties, 20 per cent by manuring and 5 per cent by protection against pests. A Committee of F. A. O. experts has estimated that India could advantageously use 1.5 million tons of nitrogen, 750,000 tons of phosphate and 150,000 tons of

* Food Problem of India: S. Pramanik.

** Food and World Problem: Opening address by Dr. B. C. Guha at the 35th Session of Indian Science Congress, Patna, 1948.

potash annually. These quantities are more than 20 times the quantities being used to-day.

Expenditure on Food.

In connection with food production, the question of giving direct subsidy to the foodgrowers should not be overlooked. By paying annually a subsidy of the order of 400 crores of rupees to the growers, the British Government has been able to stimulate greatly the food production in Britain and also to keep the prices of all important foodstuffs within the means of the poorest consumer. Potatoes have been selling in England for several years now at 2.5 annas a seer. But India has been importing 125 crores of rupees worth of foodstuffs, particularly cereals, from abroad and has hardly spent a fraction of this sum as subsidy for stimulating food production inside the country. Although India can hardly subsidise internal production on the scale that Britain has done, she can certainly proceed in the same direction. This would add to food production and at the same time save some foreign exchange for buying capital goods.

Food Damage by Insects and Rodents.

A question which requires immediate attention particularly in tropical and subtropical countries is that of preservation of food against rodents, insects, moulds and bacteria. It is indeed a pity that it is precisely in zones where the standard of food production is low that the methods of food preservation are also less developed, thereby aggravating the shortage. In India alone several million tons of food of all kinds—cereals, fish, vegetable, milk, etc.,—could be saved by adopting modern methods of preservation and processing.

Apart from the well-known scientific methods of approach to the problem as indicated above, consideration should be given to the adoption of a new attitude and unorthodox methods to help the solution of the problem. During the War, in Germany wood was converted into sugar, in which yeast was grown which was fed to cattle to provide milk. Germany also produced fat from coal. During 1946 groundnut flour prepared after the expression of oil from groundnuts was used in India for incorporation with atta. This indeed improves the nutritive quality of atta. In the U. S. A. the incorporation of groundnut flour in bread has been advocated.

Regarding rice, it has been estimated that if 90 p.c. of the rice consumed as raw rice in this country was parboiled, there would be an annual addition of about 400,000 tons of whole rice for human feeding due to reduced breakage of parboiled rice. Parboiled rice is known also to be nutritionally superior to raw rice. This might require some change in food habits. These habits may also require to be changed in the direction of eating more potatoes and other tubers in place of cereals, considering that tubers are heavy-yielding and would give more calories per acre than cereal grains. A partial diversion of food habits from cereal grains to potatoes might ease the pressure on calories.

Another potential source of human food is green leafy material. During the last few years it has been shown that their protein has a biological value almost equivalent to that of meat. Methods have been devised for extraction of this protein. Attempts have been made also to convert wheat plants themselves into human food. The enormous quantities of planktons of the seas have been sought to be tapped as a source of food. These are methods which are almost revolutionary but which, if successful, would lead to a great increase in the world's food supply.

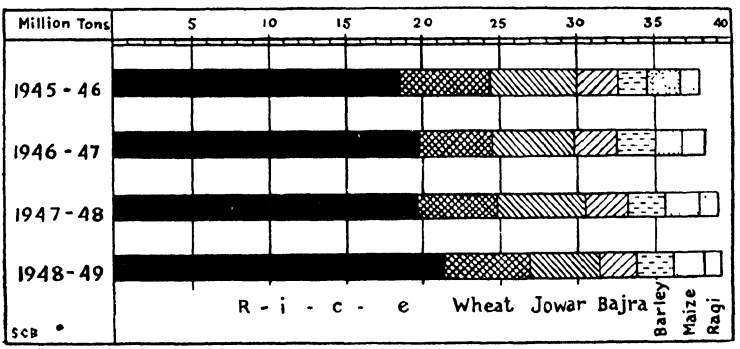
The problem of over-population is largely a bogey. If mankind is willing to adopt new and revolutionary scientific methods, tap unusual sources of food, change to some extent their food-habits which in any case have changed during the ages and change also the present socio-economic system which acts as a brake on production and encourages artificial scarcity, then mankind need not worry about food. The question is whether man will accept the challenge and will be wise enough to follow rational lines for the unlimited advance which lies before him.

Total Production:

The following table gives the production of main cereal crops in lakh tons from 1945-46 to 1948-49.

	1945-46	1946-47	1947-48	1948-49
Rice	185	199	195	217
Wheat	59	47	54	54
Jowar	56	53	57	48
Bajra	27	27	28	22
Barley	20	24	24	22
Maize	21	20	20	17
Ragi	12	15	15	14
Total —	380	385	393	394

The table shows that food grain production is steadily rising. This is specially with regard to rice. The total food grain production in 1949-50 is expected to about 10 lakh tons more than 1948-49. The rice production in 1949-50 has been 221 lakh tons as compared to 217 a year ago.



Map 26
Total annual cereal production of India.

Food import:

The heavy drain of money from India for importing food is evident from the following figures for such imports.

1944-45	....	....	Rs.	14 crores
1945-46	....	....	,,	24 ,,
1946-47	....	....	,,	89 ,,
1947-48	....	....	,,	100 ,,
1948-49	....	....	,,	131 ,,

The years 1948 and 1949 are compared below:—

Year	*Import in lakh tons*	*Cost*
1948	28	Rs. 130 Crs.
1949	37	Rs. 148 Crs.

The following food import plan was drawn up in 1949:— 1950, 19.1 lakh tons; 1951, 11.28 lakh tons and 1952,8.48 lakh tons.

Later on it was decided to stop all food imports after 1951, and to import 15 lakh tons in 1950. However, plans had to be changed again and it was decided to import 20 lakh tons of food in 1950.

Plans to make India self-sufficient in food include austerity measures, including the popularization of making every Monday a vegetable day, better storage of food and the "Grow more food" campaign. Tapioca, a starch food is being grown in Travancore-Cochin, and has now been successfully grown in West Bengal. Research on food crops to produce new prolific and hardy varieties is being intensified. Fallow land is being increasingly brought under the plough by the use of tractors. New irrigation and river project schemes are being put through.

Classification of Agriculture:

In India practically all agriculture is intensive, due to the pressure of population. Though expenditure per acre is necessarily low, much hard manual labour is put into agriculture, and so it may be called intense.

According to seasons of growth, crops are divided into three types (a) *Kharif*: or monsoon summer crops. They are rice, millets, maize, summer pulses, cotton, jute and groundnuts.

(b) *Kabi*: or winter crops. They include wheat, barley, linseed, rape, mustard, winter pulses, potato.

(c) *All year crop*: Sugarcane.

A three-fold classification may also be made on an economic basis:

(a) *Cash or money crops*: Jute and cotton are best examples of cash crops. They are grown by the farmers for selling and getting money in return. The money is utilized to buy things required for the family needs and for agriculture.

(b) *Home consumption crops*: They are grown to be consumed locally. They are generally food crops. Though part of good quality rice and wheat is sold and is a cash crop, millets are nearly wholly used for home consumption.

(c) *Double purpose crops*: such as groundnuts are used as food, and they also supply the needs of industry.

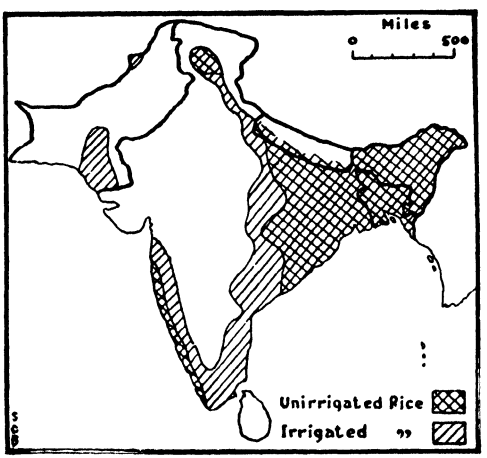
CHAPTER—IX

AGRICULTURE—CROPS

Rice

Rice is by far the most important crop of India. It occupied 70.3 million acres of land and the production was 21.7 million tons in 1948-49. It is a staple food for the whole of the eastern and southern parts of India.

In two words rice requires heat and moisture. Thus it is a leading crop where summer is the rainy season. In fact temperature is not so important as moisture, for rice grows in summer in Kashmir, where a blanket of snow covers the land in winter. Rice



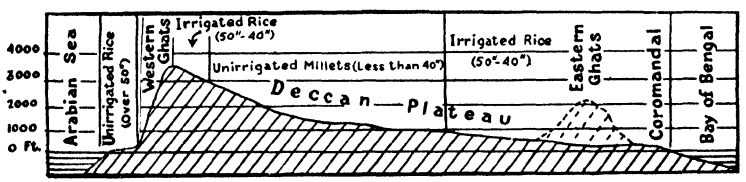
Map 27
Rice cultivation.

is the staple food of Kashmiris. Rice has rather exacting demands for the supply of water. Nearly all kinds of paddy must stand in water during the early part of their growth. Water stands in the fields even when harvesting. But only special kinds can stand submergence, and even those not more than four days. 50 inches

of annual rainfall, or more is good for rice. This humidity is too much for any other cereal. Rice being the 'Waterproof' cereal—being the hardest grain, coated by a hard shell, immune to boring insects, and encased in a tight fitting husk, is the only cereal which can grow in such a climate. When the rain is less than 50", but the temperature is too high for growing wheat etc., irrigation is needed to grow rice. However below 40", even irrigation is not employed and millets take the place of rice, specially when the soil is poor.

Distribution:

River delta flats are the great rice producing spots nearly all over the world, and India is no exception. Gangetic W. Bengal is a great rice grower. The deltas of Mahanadi in Orissa,



Map 28

Section across Deccan Plateau, showing correlation between annual rainfall and cultivation.

Godavari, Krishna and Kaveri in Madras are big producers of rice. To these areas may be added the alluvial flood plains of rivers, the western coastal strip of Deccan, specially its southern part (Malabar), and the Kashmir Valley, where enough water is available.

Conditions of growth in Deccan require special mention. Here the following belts, running north-south may be recognised. Fig. 28 illustrates it in an east-west section. The belts from west to east are:—

(i) Western coastal strip; rain over 50"; rice without irrigation.

(ii) Just beyond the crest of Western Ghats; rain 50"—40"; rice with irrigation.

(iii) Central part of Deccan Plateau; rain below 40" no rice, millets are grown.

(iv) Broad eastern coastal strip, with river deltas; rain between 40"—50"; rice with irrigation.

Irrigated rice also grows in the foot-hills of Western Himalayas, and it is a very good quality table rice. The broad river valleys in Kumaon Himalayas grow rice. Hill slopes are terraced to a great perfection for this purpose. They often resemble a Chinese landscape.

Labour requirements of rice:

Rice requires hard labour. Intensive preparation of the field is first required, including weeding. Transplantation requires further hard work in a moist, hot climate. Workers have to stand all the day in mud and rain. Where the land is not level, careful terracing has to be done, which requires enormous labour. Rice has not yet been adapted to mechanical farming, though aircraft have been used for broadcast sowing in U. S. A. and U. S. S. R. So rice requires dense population for agricultural needs. Even then labour has to be imported for sowing and harvesting seasons. Reciprocally rice, when compared to other cereals gives the largest return in calories per acre, and thus supports the most dense populations. The case of W. Bengal and Malabar where the density per square mile is often well over 1,000 and even over 2,000 may be cited as an example.

Types of Paddy:

In Eastern India three types of crops are recognised, according to the season of growth. They are:

(a) *Aman paddy*: This is the most important type of paddy and gives the main amount of crop. It is sown in the beginning of the S. W. monsoon. As the monsoon proceeds westwards, the sowing also proceeds in the same direction. Aman paddy is generally *transplanted,* being grown first in a nursery. The quality of aman rice is generally good, and contains some famous varieties. The crop is harvested as the monsoon retreats. So it starts from the west and moves towards east, the last area to be harvested being in West Bengal.

(b) *Aus Paddy*: This is a quick growing variety. It is sown just after the norwester showers in April or May, and snatched as a second crop, being harvested sometimes in August.

Preferably, it is grown on high land. It gives a poor quality of rice and is consumed locally. In the present shortage of food aus paddy finds its way to city markets.

(c) *Boro Paddy*: This is also a rough quality rice, which is grown in marshy areas, or edges of *bils*, or large swampy lakes, common in the delta. This land is covered by water during rains. In November or December as the water drains away or dries up, boro paddy is broadcast or transplanted on the newly exposed damp ground. It is harvested in March or April.

Broadcast paddy of all the three varieties mentioned is grown by scattering seeds in the fields. Generally it is a rough quality of rice.

Upland paddy is a very rough kind of paddy which is grown in the hills, very often by tribes living in the forests. Some types grow on dry ground without standing in water.

Production of rice in thousand tons for 1946-47, by States is as follows:—*

1. Madras	....	4,919	6. Madhya Pradesh	....	1,401
2. W. Bengal	....	3,708	7. Orissa	....	1,401
3. Bihar	....	2,768	8. Bombay	....	846
4. Uttar Pradesh	....	1,774	9. Punjab	....	127
5. Assam	....	1,421			

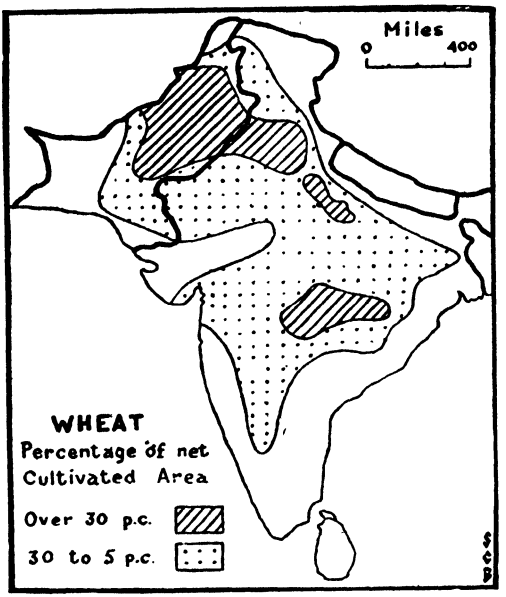
Wheat

The second most important cereal of India is wheat. Production in 1948-49 was 5.4 million tons. and acreage 21 million acres. Compared to rice, it grows in just the opposite condition. While rice requires heat and humidity, wheat requirs a cool and dry climate. While it grows in spring or summer in temperate lands, it is a winter crop in India. It always likes deep, rich, friable loams. It will not grow in poor soils. While a limited growing season controls the northern limit of wheat in temperate lands, in India wheat enjoys an unlimited season, for snow never falls. Excess of moisture in the east and heat in the south put a limit to wheat cultivation. Wheat does not easily grow where rainfall is above 40 inches annually.

*Agricultural statistics by States in this chapter is taken from the Government of India Statistical Abstract 1946-47; published 1949.

The most important wheat growing area occurs in the irrigated colonies of Punjab and Uttar Pradesh. Here the yield of wheat is high and the quality good.

The next important wheat producing area is the Upper Narbada Valley and the Chattisgarh Plain in Madhya Pradesh Here no major canal systems exist like Punjab. But tank irrigation is available in many parts. An example is the Khindsi artificial reservoir 40 miles from Nagpur. The yield and quality of wheat is poor here. This area contains 3½ m. acres of wheat lands.



Map 29

Some wheat grows even in the Nilgiris and Dharwar District of Bombay. Good soil patches, where irrigation water is available grow wheat, in Hyderabad. In the eastern limit some wheat is found as far east as Kandi Subdivision in Murshidabad District, and a little in Birbhum and Burdwan. But here it is grown as a novelty. Perhaps it will be possible to grow more wheat when the Damodar Project is complete. Wheat grows under temperate conditions in Kashmir, Himachal Pradesh, Simla and Kumaon Hills. Here some snowfall is welcome.

Wheat is grown by the Indian peasant partly as a cash crop. A wheat marketing survey showed that approximately 45 per cent of the crop is consumed locally, while the rest goes into trade, mainly internal now.

This crop was one of the first to receive attention from Central and State Agricultural Departments of the Government. In 1936 the area under improved wheats exceeded 7 m. acres of which 3½ m. was in Punjab, 2½ m. in U. P. and over half in M. P. The important improved varieties are Punjab 8A, Pusa 12, Pusa 4, and the rust-resisting *Sharbati* of M. P. The use of the latter should extend in view of the great damage to wheat crop in Central India in 1947.

The yield of wheat in India is low as compared to European countries, but it compares favourably with other countries. Yield in bushels per acre for some countries is given below:—

Holland	....	....	45
Germany	....	....	32
Japan	....	....	28
U. S. A.	....	....	15
U. S. S. R.	....	....	11
Australia	....	....	11
India	....	....	10

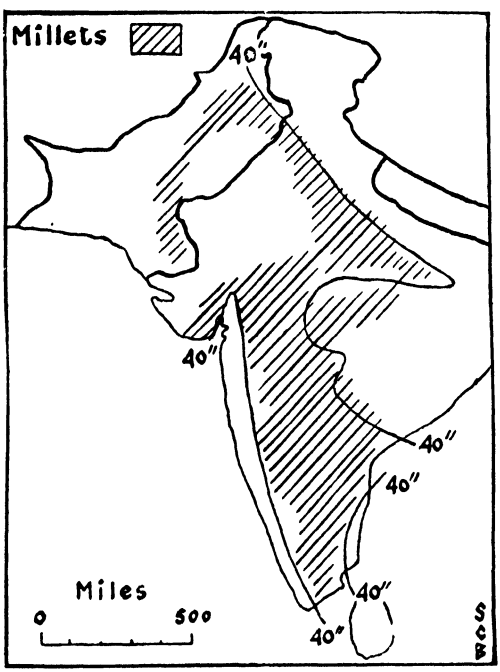
India exported wheat up to 1939. The export reached a peak of 1.7 million tons during World War I. It stopped during 1930-35, when prices were very low. Half million tons were again exported annually form 1936 to 1939. But from 1943 India is importing wheat from Australia, U. S. A., Canada and Argentina.

Production of wheat in thousand tons for 1946-47 by States is as follows:—

1. Uttar Pradesh	2,349	5. Bombay	111
2. Punjab	1,018	6. W. Bengal	26
3. Bihar	346	7. Delhi	11
4. Madhya Pradesh	112	8. Ajmer	8

Millets

This is the third most important crop of cereals in India. Millets generally grow in poor soil and are always unirrigated. Millet growing lands have a rainfall between 20 and 40 inches annually. Thus when rain is below 40 inches, the choice for growing a millet or wheat falls on the soil. If the soil is rich and irrigation is possible, wheat is invariably grown. Millet is the usual crop on poor hilly soils. It is the most important crop of Rajasthan, Madhya Bharat, Madhya Pradesh and Central Deccan. Of the many varieties of millets *jowar*(*or cholam*) and *bajra* are the most important. Other kinds are *marua*, which



Map 30

grows in Chotanagpur, *gundli* and *ragi* growing in Deccan. Millets are all kharif (monsoon or summer) crops. Jowar occupied 35.4 million acres of land in 1948-49, the production being 4.8 million tons. Among millets jowar grows on comparatively better soil. It is the national cereal of Berar, and much

prefers the black cotton (regur) soil. It is also grown as a rabi crop in this region. It is often grown on quite a substantial scale as a special fodder crop. In Deccan jowar grows in the valleys of Narbada, Tapti, Godavari and Krishna, while the thin soils on ridges in between the valleys grow bajra. Both millets are consumed in the villages, and only a part of it comes to towns for feeding labourers. Millets have a better food value than rice, but their taste and appearance is not much liked by customers. One fifth million acres are sown by millets of improved varieties evolved by the Agricultural Department.

Production of Jowar in thousand tons for 1946-47 by States is as follows:—

1. Bombay	....	1,102	4. Uttar Pradesh	....	423
2. Madras	....	881	5. Punjab	....	52
3. Madhya Pradesh	....	825	6. Bihar	....	16

Bajra occupied 20 million acres of land in 1948-49, the production being 2.2 million tons. Bajra grows in the worst soils, which can not support any other cereal crop.

Production of Bajra in thousand tons for 1946-47 by States is as follows:—

1. Madras	....	517	4. Punjab	....	211
2. Uttar Pradesh	....	469	5. Bihar	....	22
3. Bombay	....	425	6. Madhya Pradesh	....	16

Barley: This crop is very similar to wheat and its conditions of growth are also nearly similar. Only it can stand more rigorous conditions than wheat. Thus it grows beyond the limits of wheat in every direction. In other words it can bear more dryness, more damp, more cold, more heat and poorer soil than wheat. It is the most important crop of desert oases. In India it is not an important cereal. It grows mainly on the eastern limits of wheat growing area. Such conditions are found in Uttar Pradesh, which is the chief producer of barley. There is some internal trade in barley. The cultivation of barley extends to the borders of West Bengal. Perhaps barley will suit better as a rabi crop here, and when irrigation is available after the completion of

various multipurpose projects, barley could be grown as a second rabi crop. Production of barley in 1948-49 was 2.2 million tons and acreage 7.7 million acres.

Production of barley in thousand tons for 1946-47 by States is as follows:—

1. Uttar Pradesh	 1,663		4. W. Bengal	....	18
2. Bihar	 375		5. Ajmer	....	17
3. Punjab	 111		6. Bombay	....	4

Maize: This is a crop introduced from the New World and is gradually gaining importance in the Old World. In U. S. A. which incidentally produces the largest quantity of maize in the world, it grows in a belt just south of the wheat belt, and requires 150 frost free nights (as compared to 110 for wheat and 200 for cotton). So it requires a warm summer (but not hot). Also the big size and large leaves of the crop want a good amount of moisture. Four inches of rain for all the five months of growth are good, and a total of forty inches or over for the year is needed. In India the rainy season is summer which is rather too hot for maize. The ideal climate for maize is provided by Harrisburg (Pennsylvania, U. S. A.) where the yield is 42 bushels per acre, and the summer monthly temperatures are between 68° and 72° F* So it seems that maize will never gain the same importance in India as in U. S. A. Here it is snatched as an early monsoon crop in Bihar, U. P. and E. Punjab. Good quality maize only grows in the cool damp summers of the hills. In Kashmir it is an important crop. It also grows in Kumaon and Simla Hills where the summers are cool and damp. Production in 1948-49 was 1.7 million tons and acreage 7.5 million acres.

Production of maize in thousand tons for 1946-47 by States is as follows:—

1. Uttar Pradesh	 753		4. Bombay	....	40
2. Punjab	 332		5. Madhya Pradesh	....	33
3. Bihar	 302		6. W. Bengal	....	33

* Economic and Social Geogtaphy. Huntington, Williams, Valkenburg.

Pulses

This very important group of crops accounts for nearly 50 million acres. They have a three fold importance for Indian agriculture.

(a) They form the backbone of many crop rotations practised in India. Fertility of the soil can be maintained with a minimum use of fertilizers by growing a pulse crop, once in every three or four years, for pulse is *leguminous,* which means that the bacteria living in its roots grow by absorbing nitrogen from the air, and thus make the soil rich in nitrogen.

(b) They supply the much needed nitrogenous food (proteins) to balance the food which consists of too much of starchy food in India. Its use is indispensable for vegetarians.

(c) Special kinds of cheap pulses, such as grams serve as nutritious animal food.

The variety of pulse crops produced in India is very great. One of the most important is the pigeon pea (*arhar* or *turo*). It grows in admixture with either jowar or cotton. It keeps growing after the millets are harvested, and is itself harvested in late winter. Lentils, *mug* and *masur* are more important in the east. *Urad* is also grown extensively in Bihar and U. P. *Kurthi* is important in the Chotanagpur Plateau. *Khesari* grows in West Bengal.

Gram is an exteremely important winter pulse which occupied 20 million acres in 1948-49; the production being 4.6 million tons. It is specially important in U. P., the Punjab and Madhya Pradesh. It is often grown in combination with wheat, specially in the black soils of Deccan. The total area under improved types of gram is nearly three lakh acres. But the systematic introduction of improved strains is yet in its early stage. Like wheat and barley it is a rabi crop and like them it benefits from winter rains in the west, caused by western disturbances.

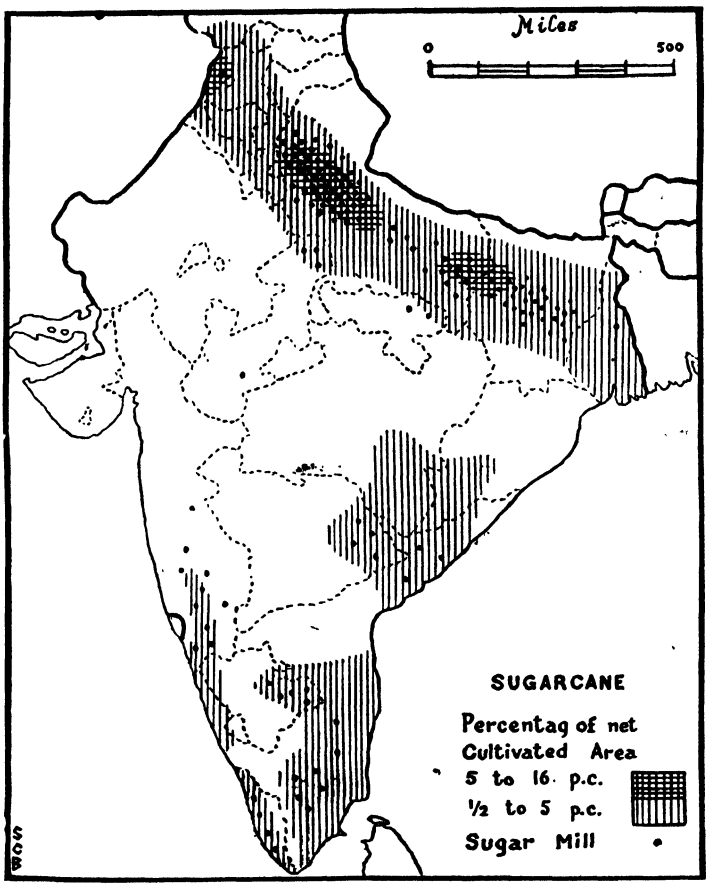
Production of gram in thousand tons for 1946-47 by States is as follows:—

1. Uttar Pradesh	1,508	4. Madhya Pradesh	192
2. Punjab	600	5. Bombay	89
3. Bihar	436	6. W. Bengal	56

Sugarcane

The area under sugarcane in 1948-49 was 3.8 million acres, and the production was 5 million tons.

This crop forms a convenient link between the food crops and the commercial crops of India. There was an increase of practically 40 per cent during the 1930-1940 period. This was



Map 31

due to a variety of causes of which the principal one was the establishment of a large modern sugar industry, consequent on

the grant of fiscal protection. An equally important cause was the spread into general cultivation of improved varieties of sugarcane which have made sugarcane production much more profitable, inspite of two thirds of the product being consumed in the form of *gur* or jaggery at comparatively cheaper rates. The protection was withdrawn in 1950.

It is one of the special features of sugarcane growing in India that nearly nine-tenths of it is situated in the semi-temperate zone and only a comparatively small proportion is grown in tropical India. The result is that the varieties of sugarcane which are most successful in India are quite different from the tropical or noble canes familiar elsewhere. The canes now in general cultivation are mainly the productions of the Coimbatore Sugarcane Breeding Station and are hybrids which include in their parentage the wild cane, some of the older Indian varieties and some of the best varieties of the tropics. The productions of the Coimbatore Sugarcane Breeding Station now occupy approximately 3 million acres.

In India nearly 60 per cent of sugarcane grows in U. P. Saharanpur cane is famous for its quality. Next comes Bihar with about 10 per cent of Indian production. Cultivation extends to all the southern districts of West Bengal. The future development of sugarcane cultivation in West Bengal depends upon adequate supply of fertilizers and irrigation facilities; otherwise the climate and soil are quite suitable. Development of new projects (Damodar, Mor and Ganges Barrage) will go a long way to augment sugarcane cultivation. In Deccan sugarcane grows as an irrigated crop in the red loams of Eastern Deccan including the Madura Plain and Coimbatore.

Production in thousand tons of raw sugar for 1946-47 by States is as follows:—

1. Uttar Pradesh	2,410	6. W. Bengal	100
2. Madras	592	7. Orissa	59
3. Bombay	414	8. Assam	58
4. Punjab	411	9. Madhya Pradesh	54
5. Bihar	393		

Oilseeds

The oilseeds form an extremely important group of cash crops in India. The total area covered by oilseeds in India in 1948-49 was 23.4 million acres and production 4.5 million tons.

Groundnut

Groundnuts occupied 9.1 million acres in 1948-49 with a production of 2.9 million tons. This is of special interest as in many parts of India groundnut is a comparatively recent production and the extension of the area under this crop has been extremely steady, having been practically uninterrupted since 1924, when the area was less than 3 million acres. The production and acreage is given below:

	Yield in tons ,000	*Area in acres* ,000
1924-25	1,273	2,330
1943-44	2,248	5,403
1948-49	2,896	9,145

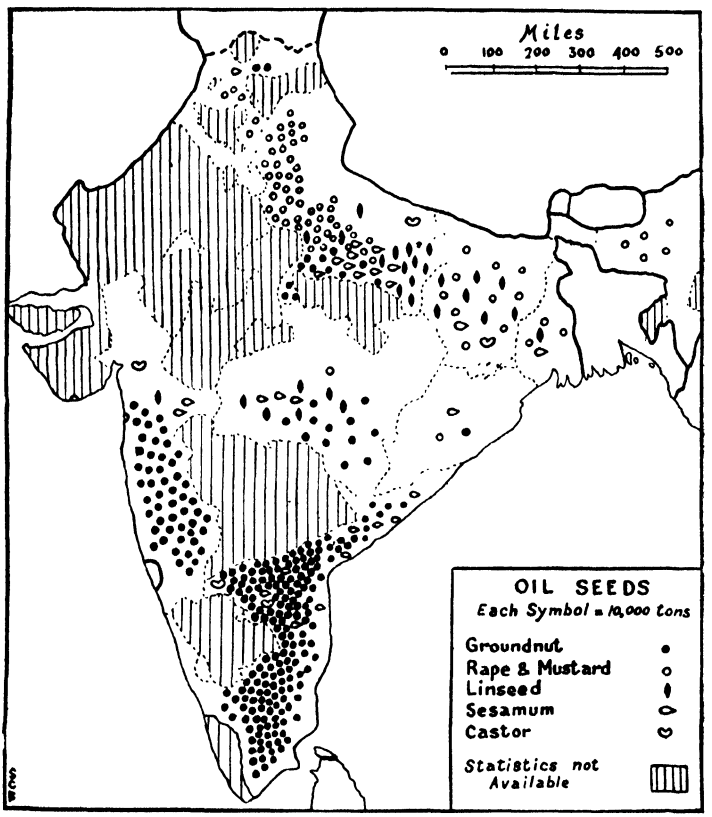
Groundnuts are cultivated in two belts in South India, a broad belt running north-south in eastern Deccan, and a narrow belt beyond the crest of Western Ghats in Bombay-Deccan. India was a great exporter of groundnuts, and also a substantial exporter of groundnut oil and cake before restrictions were put on its export. Groundnut oil is an important edible oil in India at present; it is also the raw material used in hydrogenated oil factories, which have grown up in India during the last few years for the production of various vegetable substitutes for ghee. Work on the improvement of the groundnut crop has been in progress in Madras for some years and has recently been intensified as a result of a grant by the Agricultural Research Council. Successful work has also been carried out in Bombay on the substitution of a disease resistant type for the older variety which was frequently decimated by the well known *Tikka disease.*

Production in thousand tons (of nuts in shells) of groundnuts for 1946-47 by States is given below:—

1. Madras	1,690	4. Uttar Pradesh	92
2. Bombay	508	5. Punjab	18
3. Madhya Pradesh	133	6. Orissa	9

Rape and Mustard

Next in importance comes the group of oilseeds of which the most important commercial types are *rape and mustard* of Northern India. These are produced mainly for home consumption. The annual area was 4.5 million acres in 1948-49 and production 726,000 tons. The oil is extremely important for food purposes



Map 32

whilst the cake is an important cattle food. Most of the rape and mustard produced in India is crushed in small crushers in villages, though an appreciable amount is handled in modern factories. Work on the improvement of this group of oilseeds is comparatively recent. Rape grows in Northern India from West Bengal to Kashmir, but it is specially concentrated in North-

western and Central parts. Uttar Pradesh produces large quantities. Its production in thousand tons for 1946-47 by States is given below:—

1. Uttar Pradesh	....	534	5. W. Bengal	....	28
2. Bihar	....	99	6. Madhya Pradesh	....	12
3. Assam	....	50	7. Orissa	....	4
4. Punjab	....	47	8. Bombay	....	2

Linseed

This is another important oilseed of India, but unlike the other two mentioned, it is not edible. It takes a great part in trade, and is used for making varnishes and paints. On the average rather more than half of the linseed is exported mainly to the United Kingdom, and the continent of Europe, the remainder being crushed in the country. The production of linseed in India in 1948-49 was 439,000 tons and acreage 3,877,000 acres. Linseed is always grown mixed with other crops. The most important linseed producing area is the Chattisgarh Plain and adjoining areas of Madhya Pradesh where it is grown in combination with wheat as a rabi crop. It also grows in U. P. and Bihar.

Extensive research in linseed has been carried out at the National Agricultural Research Institute for many years. The Indian linseeds have been completely classified, the various types isolated, and the hybrids between the bold large-seeded type of the black soil areas and the small-seeded prolific type of the Gangetic Plain have been produced. Several of the hybrids have a high oil content and a medium size seed. The introduction of improved types into general cultivation has recently been undertaken.

Production of linseed in thousand tons for 1946-47 by States is as follow:—

1. Uttar Pradesh	....	145	4. W. Bengal	....	8
2. Bihar	....	67	5. Bombay	....	5
3. Madhya Pradesh	....	48	6. Punjab	....	2

Sesamum

This is another edible oilseed which grows in dry or semi-humid conditions. The oil is used for culinary purposes in

Gujerat. It is now used for making vegetable ghee. Production in 1948-49 in thousand tons was 323 and area in thousand acres 4,502.

Production of sesamum in thousand tons for 1946-47 by States is:—

1. Uttar Pradesh	....	92	5. Bihar	....	10
2. Madras	....	79	6. Orissa	....	8
3. Madhya Pradesh	....	30	7. Punjab	....	6
4. Bombay	....	14	8. W. Bengal	....	6

Castor

It grows in the dry parts of Deccan plateau (Mysore) and Kathiawar. It is another oilseed which is not edible and is used in industry. Being thin the oil is employed as a base for cosmetics. Its low freezing point makes it useful for lubricating aircraft machinery. Production in 1948-49 was 108,000 tons and area 1.4 million acres.

By States the production of castor in thousand tons for 1946-47 is:—

1. Madras	....	19	4. Bihar	....	4
2. Bombay	....	5	5. Uttar Pradesh	....	3
3. Madhya Pradesh	....	4	6. Orissa	....	2

Cotton

Of the purely commercial crops of India pride of place must be given to cotton. India is second only to the United States amongst the cotton producing countries of the world. Unlike America, there is no single cotton growing belt and cotton of several distinct species and commercial varieties is grown in the different states under quite varying conditions.

The most compact single block of cotton cultivation is in Madhya Pradesh, Khandesh and Saurashtra with extensions into Rajasthan, Madhya Bharat and Uttar Pradesh,where the cotton produced is mainly of short staple types. Of such types approximately one million bales were consumed in the country and the remainder exported largely to Japan before 1941. India also exported substantial quantities to the United Kingdom and the continent. The long staple cotton of Gujerat and part of

Kathiawar, of the southern part of the Bombay Presidency and a large portion of Madras consists of various forms, differing in important characters but closely related. The third group consists of American type which are the result of the acclimatization of imported types and now occupy 3½ million acres in Dharwar and Madras. These are all types of much longer staple, suitable for higher counts and are in substantial demand by Indian mills. Work on the improvement of the cotton crop has been systematic and sustained, especially since the establishment of the Indian Central Cotton Committee in 1921. The total area under improved strains now in general cultivation is 3.8 m acres. During the last 15 years a radical change in the balance between short staple and long staple cottons in India has occurred. In the typically short staple tracts better yielding and hardier types which are more profitable to the grower, have been introduced and new areas of long-staple cotton created in Bombay and Madras. The local cottons have been improved in staple and uniformity by the application of modern plant-breeding methods. The cotton crop is also unique in that for the last 15 years there has been maintained in India a Technological Research Laboratory under the Indian Central Cotton Committee. Here has been carried out systematic work on the characters which determine the quality and spinning value of cotton and also the systematic testing of new strains of staple, so that better yielding and hardier types which are more profitable from every point of view may be brought into cultivation.

After partition India is unable to meet her needs of long staple cotton and has to develop her cotton policy on the following lines:—

(a) Amicable trade relations with Pakistan, ensuring an exchange of cotton with cloth and yarn. This is possible for the time being for as time proceeds, Pakistan is sure to build her own textile industry, and when this is done India will not get cotton from her neighbour.

(b) Increase in cultivation of long and medium staple cotton. This is already growing in Kathiawar, Dharwar and Madura. Its acreage should increase.

(c) Improvement in the quality of cotton in the short staple area (Gujerat, Berar, North Bombay), so that finer counts may be made out of it.

(d) Production of machinery and discovery of new processes by which the short staple cotton may be able to yield finer cloth.

(e) Search for other sources of import such as Egypt, East Africa etc.

Eleven million acres of land was under cotton cultivation in 1948-49 and 1,864,000 bales (of 400 lbs) of cotton were produced.

Production by States of thousand bales of cotton for 1946-47 is as follows:—

1. Madhya Pradesh	....	462	5. Uttar Pradesh	....	44
2. Madras	....	336	6. Assam	....	12
3. Bombay	....	220	7. Bihar	....	7
4. Punjab	....	123	8. Ajmer	....	4

Government is sparing no pains to raise the production of cotton. 205,000 acres of new land will be put under cotton in Madhya Bharat in 1950, and 50,000 acres in Bhopal. This will augment the yield by 55,000 bales. Intensive cultivation methods will be followed here including the use of fertilizers and improved seeds, which will increase the yield per acre. The improved seeds thus multiplied will be distributed next year to other cotton areas, raising their yield.

Jute

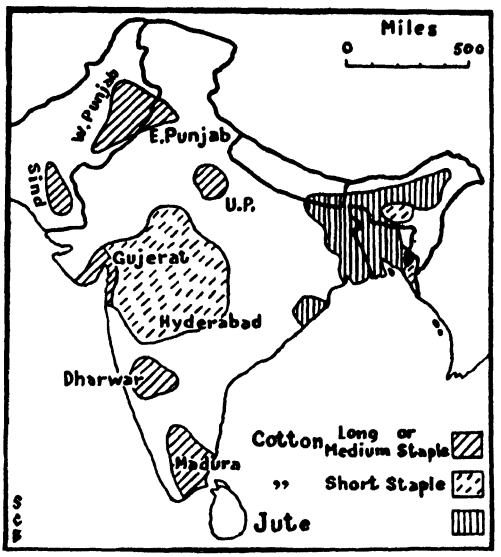
From 1920 onwards to 1932 jute production gradually fell due to various causes, given below:—

(1) General trade slump and fall in the price of jute.

(2) Falling demand in the world due to (a) New methods of bulk-handling of grain by means of compressed air doing away with the use of bags, (b) Self-sufficiency policy of some nations, stopping the import of jute by law, (c) Growing of substitute fibres or jute in Formosa, Java, Brazil, Argentina and South Africa.

But inspite of all this, jute will find a ready market if its price is kept at a reasonable level, for nothing can compare to cheap jute bags in the matter of packing goods, specially grain. There has been a great demand for jute cloth and bags in the post-war period.

Jute grows in East Pakistan riverine lands in the alluvial soil, where rainfall is copious. In West Bengal, Purnea and Cuttack it grows on comparatively higher lands. Work for the agricultural improvement of the jute crop has mainly been devoted to the



Map 33

establishment of higher yielding varieties of quality not inferior to the standard trade types. Such work has been markedly successful, the area under improved strains being approximately .5 million acres. The Indian Central Jute Committee, has been established for the improvement of this important agricultural industry.

Effect of partition on Jute.

While the best jute growing lands are in Pakistan nearly all the jute mills are around Calcutta. Thus when Pakistan produced 3,970,000 bales, India produced 1,455,000 bales in 1943-44. The production rose to nearly 8,000,000 bales in the two Dominions in 1945-46. Of this 22 lakh bales were exported raw and 65 lakh bales consumed by Indian mills. The following suggestions may be noted to meet the situation.

(a) Growing more jute. This will go against the Grow More Food Campaign. Yet this has to be done to supply raw material to the Calcutta Jute Mills.

(b) Supply from Pakistan depends upon amicable relations.

(c) Ultimately Pakistan will establish her own jute mills near Chittagong, and then India will have to grow her own jute.

(d) But mutual agreement to control production between India and Pakistan will be necessary. The present high demand will not continue for long. In the lean periods over-production will lead to drop in prices. If India grows 65 lakh bales for her mills, it will mean nearly doubling of production, and so a fall in prices. Thus sooner or later India and Pakistan will have to arrive at some reasonable agreement to avoid over-production.

Meanwhile the production of jute has gradually increased in India. The area under jute rose from 652,000 acres in 1947-48 to 834,000 acres in 1948-49. The production in the same years rose from 1,696,000 to 2,055,000 bales (of 400 lbs.) Production in thousand bales of jute in 1946-47 by States is given below:—

1. Assam	 482	3. Bihar	 251
2. W. Bengal	 473	4. Orissa	 58

It is estimated that 3,117,000 bales will be produced in 1949-50 Additional acreage targets for 1950 are:— W. Bengal—200,000 acres; Assam—50,000 acres; Bihar—100,000 acres; Orissa— 100,000 acres and Uttar Pradesh—50,000 acres. The marshy areas of Terai belt in Uttar Pradesh are suitable for jute, and refugees from East Bengal are being settled here. The area under *mesta*, a jute substitute, is being increased in Bombay. Jute is also being grown in Malabar.

Hemp

Though far less important than the two fibres perviously mentioned, the Indian and Sunn hemps are of no small importance in the aggregate. Sunn hemp, the more important of the two, occupies annually an area of about 600,000 acres. Exports are about 33,000 tons per annum. The other variety of hemp sometimes known as Roselle hemp and otherwise as Bimlipatam jute, is of more importance for local use than for world trade. Both kinds are used largely for the manufacture of ropes and twine in

India. Sunn Hemp is of importance from another point of view, in that it is the most generally successful of the green manure crops.

Other fibres are yielded by *Simul,* which gives the fine cotton used for stuffing pillows. A *Sisal* hemp plantation has been grown near Hazaribagh town. The fibres are worked by the jail population. As sisal grows on very poor soils, it has a good future, for it makes unproductive lands useful.

Tea

Of the various plantation crops of India, tea is the most important. Like jute it gives the much needed foreign exchange for buying foreign machinery, so necessary for industrializing independent India. Unlike jute the main quantity of tea is produced by India and has not been affected by partition.

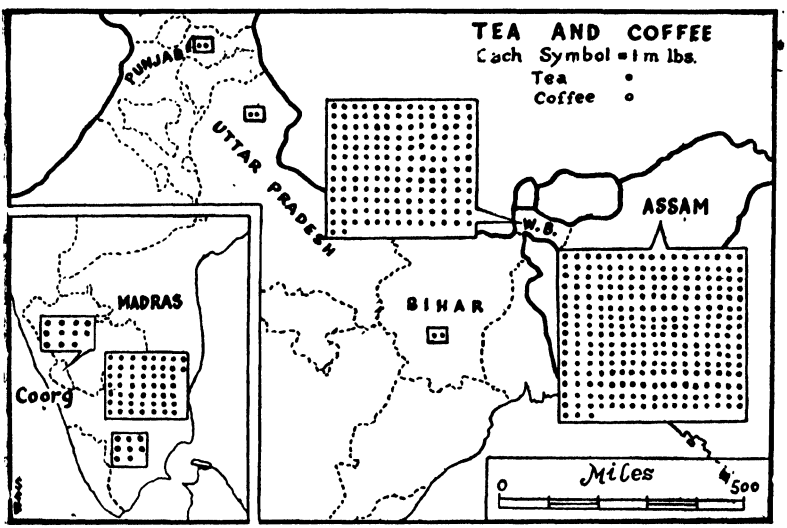
The most important condition for growing tea is heavy rainfall, if possible all the year round, for then picking can continue throughout the year. Unfortunately this is not so in India, and so the yield in India is lower than that in Ceylon. Hill slopes, where water runs off, and does not stay, are the best. Yet tea is gradually spreading on the plains of Jalpaiguri and Assam. The other important area for tea is Nilgiris and southern parts of Westerm Ghats, including Cardamom Hills. But this is only a minor area. Some tea is also grown in Chotanagpur Plateau, but many tea gardens have been abandoned, as on the Mahudi hill in Damodar Valley. Some tea is grown in the Kangra Valley in E. Punjab, and at Beni Nag in Almora District.

Production of tea by States in million lbs for 1946-47 is given below:—

1. Assam	 275	4. Bihar	.... 2.4
2. W. Bengal	 158	5. Uttar Pradesh	.... 1.7
3. Madras	 51	6. Punjab	.... 1.7

Another consideration which gives the Indian region a monopoly in tea production is the cheap semi-skilled labour available. Plucking of leaves requires a skilful manipulation of fingers, and this is found only in Asian countries. But for it, tea, could have been grown in many other countries.

As is well known, tea production all over the world has been excessive and an international scheme to control tea production is in operation since April, 1933. Export quotas are allotted by the International Tea Committee as a percentage of standard year 1929-30. The current figure is 87½ per cent.



Map 34

In tea we have an example of a very highly organized planting industry maintaining its own scientific departments in Northern India by the Indian Tea Association and in South India by the United Planters' Association. As a result, much valuable work has been done, and a consistent policy followed over a long series of years to the great good of the industry. Of recent years the work in scientific departments of the two associations has been mainly devoted to a study of the fundamental reasons underlying cultural and manurial methods.

Yearly production of tea in million lbs is given below:—

1946——551	1948——569
1947——561	1949——575

It is estimated to be 600 m lbs in 1950.

Tea export. Tea is a great earner of foreign exchange and its export is on the increase. Mincing lane, London, the great

tea entrepot is now being replaced by Calcutta, where storage and grading facilities are now being provided. U. K. is the biggest buyer of Indian tea and buys nearly 75% of the amount exported. U. S. A., Canada, Australia, the Middle East and U. S. S. R. also buy good amounts of tea. Recently great efforts have been made to popularize tea in U. S. A. to earn more dollars. The following figures give the export of tea:—

Year	*Exp. in m lbs.*	*Cost in Crores of Rs.*
1947-48	383.9	54.9
1948-49	405.7	63.6
1949-50	439.5	72.1
1950-51 (Est.)	452.0	75.0

Coffee

It is the second most important plantation crop of India. All of it grows in South India. In 1943-44 the production was 35 m lbs. and the acreage 193,000. It grows in one single area in the hills of South India which comprise part of Madras, Mysore, Coorg, Cochin and Travancore. In 1946-47 Coorg produced 11 million lbs. of coffee and Madras 8 million lbs. It requires rich forest soils containing much humus (organic matter), a result of falling leaves. Heavy rainfall and a shady aspect are other requirements. Coffee is a universal drink in South India. It is being gradually popularised in North India by the Coffee Market Expansion Board.

Coffee was first brought from Arabia (Yemen) and planted in South India; from here it spread to Java, Brazil and South Africa. In 1880-90 the plantations were destroyed by a pest, and were replaced later by tea. Others were regrown by Coffea Robusta, a plant resistent to the pest.

India is one of the most important producers of fine mild coffee in the world. Of the total number of nearly 7,000 plantations reported, over 3,000 were small plantations of between 5 and 10 acres covering about 20,000 acres in all. Coffee research is provided for at the Coffee Research Station at *Balehonnur* in the Mysore State, and is financed by the Mysore Government and the United Planters' Association of Southern India. The recently established Indian Coffee Cess Committee is mainly concerned with

propaganda to increase the consumption of Indian Coffee both in India and abroad, and works in London.

Coffee export fell to nil in 1948, being about 12,000 tons on the average, per year, previously. Efforts were made to reopen export. 740 tons of coffee was exported in six months ending September 1949. U. K. is again the biggest buyer of India coffee.

Cinchona

This is another plantation crop, used for the production of quinine, an anti-malarial drug. At present there is a big plantation at Mangpu in Darjeeling and another in Nilgiris. The climate is suitable and production could be increased. But the successful production of synthetic drugs like Paludrine will not encourage any extension of plantations.

Tobacco

It was brought to India by Portuguese in 1508 and has spread since then in various parts of India. India is now the second most important producer in the world. But like the other crops the quality of Indian tobacco is poor. Attempts have recently been made to grow good quality tobacco. Tobacco covers one million acres of land and the production is over ½ m tons. Tobacco is a very exhausting crop and it generally grows in fresh alluvial soils. Otherwise the soil has to be highly manured and even then tobacco is grown in rotation of 3 or 4 years.

Tobacco is taken and smoked in various ways, but modern cigarette manufacturing is only recent. The most important uses are making of *biris* and manufacture of tobacco for *Hookas* (Hubble-bubble). Tobacco cultivation is concentrated in a few zones.

North Bihar: Here it is grown in the Ganges Basin. The government is trying to introduce improved varieties.

Andhra: Here specially in the Godavari and Krishna Deltas, Virginia type tobacco is being grown. It is grown by rotation.

Madura: This tobacco is exported to Burma for Cheroots. It is also used in Trichinopoly for making Cigars.

Belgaum, Baroda, Kaira and Satara: This is the tobacco zone in Bombay.

Production by States of tobacco in tons for 1946-47 is given below:—

1. Madras	....	90,000	5. W. Bengal	....	10,900
2. Bihar	....	41,500	6. Orissa	....	9,900
3. Bombay	....	34,100	7. Assam	....	9,400
4. Uttar Pradesh	....	20,400	8. Punjab	....	7,200

A new type of tobacco named "Amarele 5" has been evolved which compares well with high class cigarette tobacco of U. S. A. It gives a good yield. More land is being brought under "Cigarette" tobacco in Guntur. "Wrapper" tobacco for cigars will also be grown in Coorg and W. Bengal. It is now imported from Indonesia and U. S. A.

Rubber

The total area under rubber in India is about 20,000 acres. Production in 1946 was 4.4 million lbs. Rubber is mainly grown in Madras, Coorg, Travancore-Cochin and Mysore. Rubber exports are limited by the International Scheme for the regulation of production. Climatic conditions in India are not optimum for rubber, which will never succeed, as it has done in Malaya and Indonesia.

Fruit

Statistics of fruit production in India are markedly deficient, especially as no small part of the total is accounted for by roadside trees and unrecorded small groves which are of special value to the rural population. But so far as can be ascertained the area under fruit is about $2\frac{1}{2}$ million acres. Fruit research has received a marked stimulus during the last few years by grants from the National Council of Agricultural Research which is financially supporting a co-ordinated scheme of work. This embraces a hill fruit Research station in the Kumaon Hills of Uttar Pradesh at Chaubattia for work on apples and other temperate climate fruits, one for mangoes and plains fruit at Sabour in Bihar, a plains fruit research station in the Madras presidency, a special scheme of work on citrus fruits at Nagpur with special reference to the *santra* type of orange, and a scheme of experimental work on the cold storage of fruit at Poona in Bombay where tests are

carried out for all the states. Chaubattia is now distributing one lakh plants of apples, pears, peaches, plums and apricots every year in Kumaon Hills, where Ramgarh has become a leading producer of fruit. Experiments are being conducted to grow grapes and pomegranates, whose supply from Pakistan is restricted. Kashmir is still the chief supplier of apples and pears. Apricots and peaches come from Simla Hills. Oranges come from Nagpur area, Darjeeling and Assam. Mangoes and guavas of Uttar Pradesh are noted for their quality. Custard apples and papayas grow in Chotanagpur. Bananas flourish in Bombay, Madras and Bengal. Pineapples of Assam are well known for their quality.

Coconuts

They form a very important source of vegetable oil, now used for making vegetable ghee. The choir is used as a fibre for stuffing matresses etc. The fruit and the kernel are edible. The chief area from which coconuts are exported is Malabar.

Coconuts are grown throughout the coastal regions of India. Bagnan in *W. Bengal* is an important exporter of coconuts. Large coconut plantations are found in *Krishna and Godavari deltas.*

Acreage (in thousands) in 1946-47 in various States is given below:—

1. Madras	623	3. W. Bengal	17
2. Bombay	25	4. Orissa	11

Potatoes and Vegetables

This group of agricultural products occupies no mean acreage in India. It also yields much food, supplying the much needed vitamins, and also starch and proteins. There is a great variety of vegetables and they grow in all climates and all the year round. They specially grow in circular belts around urban centres. Potatoes are the most important crop of the acid soils of hilly regions, including the Himalayas and Nilgiris. During winter potato seeds brought from the hills are sown in the plains, and give a very rich harvest of food. Potatoes and other tubers, such as sweet-potatoes, give a great return in food value from land. The calory yield of potato per acre is ten times that of rice. Some food

experts have suggested the substitution of tubers (potatoes, sweet-potatoes, cassava) for cereals to meet the food shortage. This has been done in many countries, including Germany.

The greatest obstacle in the extension of the area under potatoes in India is the non-availability of sound, healthy seeds in adequate quantities, at the right time and at a reasonable price. The crop grown in the plains gets diseased and, therefore, seed has to be brought from the hills or imported from abroad. Researches have shown that healthy seed can be produced in India, and according to Barns, "given disease-free seed-potatoes and suitable manuring, the production of potatoes on the existing acreage can be doubled". Steps have been taken by the National Council of Agricultural Research for the production and distribution of healthy seed. There are vast areas which provide suitable soil and climatic conditions for potato cultivation and in many parts of India two crops can be raised in a year. Simla, Kumaon, Nilgiri and Darjeeling hills are great suppliers of potatoes and potato seeds.

Sweet-Potato: If potato is the tuber of the cooler regions, sweet potato may with greater justification claim to be the tuber of the warmer regions of the globe. If potato is the tuber of the West, sweet-potato is the tuber of the East. Even two crops a year, each yielding 200 maunds per acre, grown over a moderate area, would convert Bihar and Bengal from deficit to surplus provinces, in carbohydrates.

Sweet-potato has this advantage over potato that it can be grown from stem cuttings and the seed problem, the greatest obstacle in the extension of area under potato, does not arise. Again its demands for soil, manure and irrigation are not exacting either.

Cassava: Nutrition experts have given their verdict and condemned it. The accusation is, that people who begin to eat cassava, eat too much of it, and suffer from protein deficiency. Like everything else too much cassava is bad; but there is not the slightest doubt that it has saved millions of people from starvation and death during famine.

The introduction of cassava into Travancore was due to the efforts of one of the rulers, who wisely foresaw its great potential usefulness as a food crop.

Early during World War II the Travancore Durbar stopped all export of cassava and its products, encouraged increased cultivation of the tuber, and thus saved the population from starvation.

It is a high-yielding tuber. A yield of 15 tons per acre has been obtained in trials in West Indies. As a higher yielder of starch it has no rival. 30 per cent of cassava flour mixed with wheat flour will make a good quality bread.* Cassava has now been successfully grown in W. Bengal.

Condiments and Spices

They form another important group of agricultural products. Chillies are grown universally, but the chillies of Patna District (Bihar) are famous. Chillies also grow in coastal districts of Deccan. Cardamoms are found in Travancore and Darjeeling. Spices grow all along the Malabar coast. Termeric and ginger grow all over India in humid and semi-humid climate.

Spices have been exported from India from times immemorial. Now they occupy the sixth place in her export trade. They earned for her Rs. 18,19 lakhs in 1949-50. U. S. A. bought Rs. 6,99 lakhs worth of spices from India this year. Her next customer was Britain with Rs. 3,41 lakhs. Ceylon came next with Rs. 1,63 lakhs.

*M. Afzal Hussain: The Food Problem of India. Presidential Address: Indian Science Congress, Bangalore—1946.

CHAPTER—X

MINERAL RESOURCES

The following table shows the mineral production in India in 1946 and 1947.*

Mineral		*1946*	*1947*
Coal (Tons)	....	29,360,685	30,144,505
Iron-ore (Tons)	....	2,407,682	2,498,459
Gold (Ozs.)	....	131,776	171,705
Manganese Ore (Tons)	....	252,916	451,034
Petroleum (Gal.)	....	64,877,535	65,192,235
Mica (Cwts.)	....	209,381	192,671
Copper Ore (Tons)	....	352,718	323,035
Ilmenite (Tons)	....	185,023	260,955
Chromite (Tons)	....	24,201	34,717
Kyanite (Tons)	....	13,489	14,351
Salt (Tons)	....	1,484,799	1,540,353
Steatite (Tons)	....	22,369	23,240
Bauxite (Tons)	....	16,405	18,537
Gypsum (Tons)	....	48,669	50,569
Magnesite (Tons)	....	44,677	51,536
Barytes (Tons)	....	29,091	24,310
Asbestos (Tons)	....	307	160
Calcite (Tons)	....	1,159	1,701
Fire clay (Tons)	....	71,595	98,463
Diamonds (Carats)	....	1,107	1,284
Lead Ore (Tons)	....	508	839
Graphite (Tons)	....	1,627	1,235
Ochre (Tons)	....	8,701	11,397
Saltpetre (Cwts.)	....	22,703	16,323
Silver (Ozs.)	....	9,821	12,422
Limestone (Tons)	....	5,663,897	3,921,579
Marble (Tons)	....	14,930	18,329
Granite (Tons)	....	374,821	322,185
Sandstone (Tons)	....	424,800	423,696
Slate (Tons)	....	9,347	13,752
Trap (Tons)	....	5,124	16,601

* Indian Minerals, Vol. III, No. 3, July 1949; Published by G. S. I.

The total value of minerals produced in 1947 was about Rs. 60 crores as compared to Rs. 50 crores in 1946.

With her present state of Industrial development, India may be said to have enough minerals. There is exportable surplus in some as in mica and manganese, which may be sold to get non-ferrous metals. Yet the geological survey of India is still very much incomplete, and we do not exactly know the mineral wealth buried in earth. Even a rough geological map of India is not complete. This is not due to the incompetence of the Geological department as to the small staff appointed by the Government. Expansion of the Geological Survey of India is one of the first needs of the country. How can we advance unless and untill we know what we possess? Some areas have been intensely surveyed, while others have been totally left out.

The natural division of India, richest in minerals is the Deccan Plateau. Here it has been rubbed down by erosion and has exposed metallic veins, or made them easily reachable. Here also were deposited coal beds in large lakes or broad rivers. Climatic causes made the cap rocks rich in Iron, Manganese and Aluminium. Much mineral wealth of Deccan has been discovered, but much yet remains to be found out. The Chotanagpur Plateau is the richest mineral area at present in India. The second most important area is perhaps Rajasthan Here perhaps much more remains to be discovered being buried under sand. Lead, Zinc and Copper in which India is deficient are all found here. It has only to be established whether these deposits are economically workable.

The great Central Plains are devoid of minerals except subsoil water. Some salt deposits are obtained on the surface.

The foot hills of the Himalayas may contain petrol throughout their length, but extensive survey is needed to find out points from where it can be extracted. Inside the Himalayas very little is known. Rocky Mountains in U. S. A. with a similar structure have been found to be rich in non-ferrous metals. So there is every chance that we shall find these metals in the Himalayas. A proper survey of these rugged mountain ranges, covered by snow on higher slopes will take some time.

A Mineral Policy Conference was convened in January 1947 to lay down the objectives of policy in clear terms. The central

aim was declared to be mineral self-sufficiency to the maximum extent possible. It was announced that the state would eventually acquire all mineral rights in land, and to this end states would be asked how best to give effect to the policy of nationalisation in their own territories. They were also to be asked to find suitable formulae for assessing compensation, and to make suitable proposals in this behalf with a view to formulating an all India policy. Meanwhile, Central Control and Co-ordination were to be introduced in the exploration of important minerals, and indigenous manufacture of ferrous and in particular non-ferrous metals was encouraged.

Nearly three months after the enunciation of the policy a five year plan for the expansion and reorganization of the Geological Survey of India was announced. The fulfilment of the plan according to schedule will constitute the crowning achievement of a century of useful work by the survey. Hitherto the activities of the survey were concentrated on accurate mapping of different mineral areas. But in future its activities will be extended with greater emphasis on geological investigations, drilling, exploratory mining and engineering geology and water supply. For this purpose four new sections have been set up. The strength of the staff of the survey has been increased. Certain specified areas have been selected for survey during the five year period of the plan. The minerals to be investigated include coal, iron-ore, refractories, manganese-ore, magnesite, bauxite, raw materials for ceramic industries, pegmatite minerals and mica. Coastal sands will be examined with a view to ascertain the presence of heavy and rare minerals such as thorium, ilmenite, zircon, etc. The formation of the Mineral Information Bureau of Mines, is part of the five year plan. The Mineral Information Bureau has commenced its work of disseminating information and giving advice to private industrialists. The Mineral Development Section carried out investigation in bauxite, limestone, iron-ore, magnesite, lignite and raw materials for ceramic industry. The Geophysical section carried its work of survey of iron-ore deposit at Daltonganj, experimental electrical methods in Jharia and Raniganj coal-fields, exploration of the new Kamptee coal-field and water survey in Jodhpur. The Drilling Section conducted operations in the Damodar and Ajay rivers for resources of sand for stowing. The

Rare Mineral Section did laboratory and field work to find the resources of minerals such as those containing uranium and thorium.

Recommendation was also made that the Indian School of Mines, Dhanbad should be enlarged and styled as the Indian School of Mines and Applied Geology; the intake should be increased gradually from 24 to 60 consisting of 48 mining and 12 Geology students. The curriculum should be brought on par with that of the Royal School of Mines, London, by greater emphasis on subjects like fuel technology, refractory and ceramics, metallurgy and geophysical prospecting. Closer association between the school and the mining industry was also advocated.

Another essential factor for the scientific development of the mining industry is research. Metallurgy plays a vital part in basic heavy industries such as engineering, ship-building, aircraft, chemical and other key industries. Recognition of its importance was shown when the National Metallurgical Laboratory was established this year at Jamshedpur for research in Metallurgical industries. The laboratory is planned to carry out research on ores, minerals and refractories as applied to Metallurgy. Government has also appointed a Board of Research in Atomic energy. It has made a grant of 2½ lakhs of rupees for this research.

Coal

Coal is the most important mineral of India, both in quantity as well as value. But when compared to other advanced nations of the world coal production in India is meagre and per capita production very low indeed. Moreover, the resources of India do not seem to be very high, and they are poor in quality. There has been a fairly exhaustive survey of coal areas, and there is little chance of discovering any big finds.

The production of coal in India in 1947 was over 30 million tons for the first time. In 1948 the production fell to 29.82 m tons, but rose again to a record of 31.46 m tons in 1949.

Coal was deposited in the Gondwana period (Carboniferous to Cretaceous) in large lakes or broad rivers formed all over the plateau. At this time dense forest vegetation covered the world, and the forests have gradually changed to coal by the heat and

pressure of earth. The Gondwana lakes extended even to the feet of the Himalayas, and coal of this age is found in the folded rocks of the Himalayan foot hills, but it is too much crushed by intense folding. Such are the Darjeeling coals. The coals on the plateau have benefited from the stability of the Deccan Block. So they are gently folded and not much disturbed by faulting. However they are pierced by dykes intruded after the coals were formed. Two types of dykes are found.

(a) *Dolerite dykes.* They are wall like features, and increase the expenses of mining. Yet they are harmless and have not damaged coal by contact metamorphism.

(b) *Peridotite intrusives.* They are very destructive and have destroyed much coal by burning it (contact metamorphism).

Otherwise conditions of mining are nearly ideal, as regards strata. Yet the way in which coal has been extracted from Indian mines has little to recommend. Nearly as much coal has been lost as has been raised actually due to bad methods of mining. While big concerns and Government concerns such as the railways employ some modern methods, small mines specially in Jharia employ extremely defective methods. Their only aim is quick profits.

The following points may be noted regarding defective mining methods:—

(1) *Sand stowing*: This method means the introduction of sand into the empty space from where coal has been extracted. Sand-stowing if practised universally will save much coal now lost in pillars, premature subsidences, mine fires, and loss of thin top layers. A thicker layer from below which has been removed results in subsidence and loss of the upper thin layer.

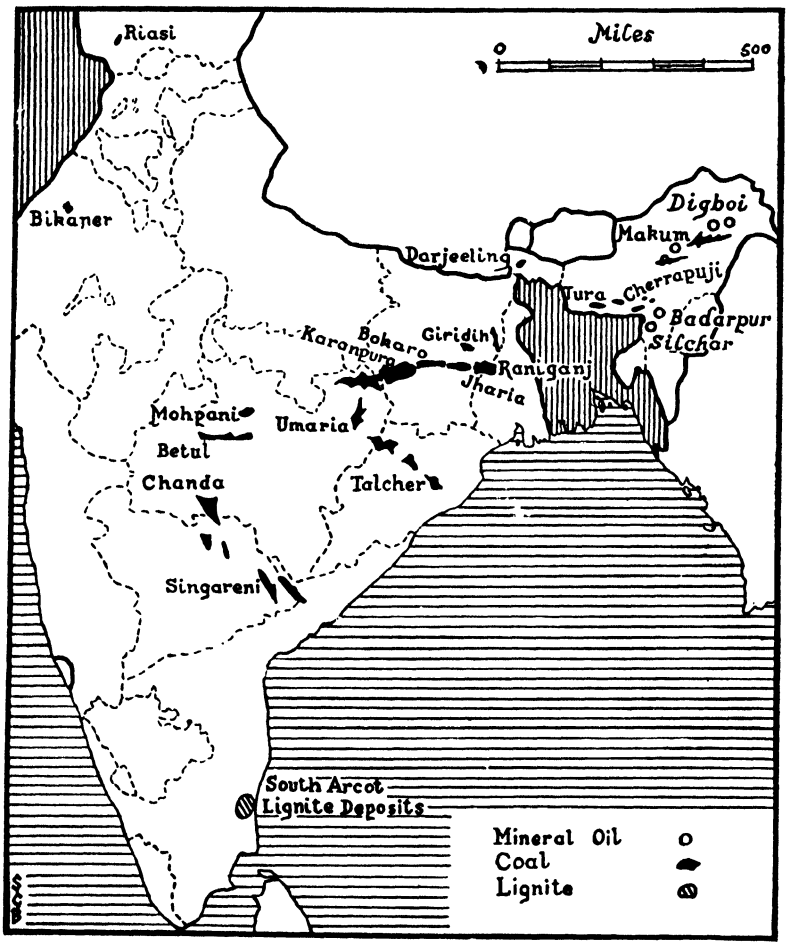
(2) *Use of machinery*: The percentage of machine cutting is very low. Even in mines where machinery is used, it is not used universally. Hand cutting breaks much coal into powder and small bits.

(3) *Absence of briquetting*: It is only done in private houses (making *gul*). While Germany, a country rich in coal, has modern factories which produce briquettes from coal powder by mixing with suitable clay, India has no such arrangements.

(4) *Open air coking*: This is the chief method of coking even now and by-product ovens are only few (At Loyabad,

Pathardih and Jamshedpur). A big plant is being erected at Sindri. Much coal and all by-products (ammonia, tar and many other chemicals) are lost in open air coking.

(5) *Improper use of Coal*: Very often good caking coal,



Map 35

which should be used for metallurgy is used as boiler coal, often in railway engines. The owner sells his coal to the highest bidder, and does not care, if it is a loss to the nation.

Government efforts to check these malpractices have been feeble. Some efforts have been made by the National Government, but we are progressing at the proverbial snail speed, if progressing at all. Nationalization of coal industry in India is yet to come and until it comes, the defects mentioned should be remedied forthwith. We shall have half consumed and half destroyed the reserves of coal we have, if we do not change our habits. The worst is the extraction of metallurgical coal and its use otherwise, for we have very limited resources of it. With enough iron-ore and limited amount of caking coal we shall not be able to develop our steel industry if all our metallurgical coal is exhausted.

In Bengal the only important field is *Raniganj,* which produces 30 per cent of the Indian needs. It contains excellent caking coals, gas coals and steam coals. Reserves now are 8,500 m tons. Reserves of no-caking coal are 1,660 m tons. Some workings here have gone below 1,000 feet and so the cost of working is increasing.

The mines of Bihar produce 58 per cent of the Indian produce. Thus Bengal and Bihar combined produce nearly 90 per cent of coal. Of the Bihar mines Jharia, Bokaro, Karanpura and Giridih are worth mentioning.

Jharia: Most of the coal suitable for metallurgy is found here. The steel works at Jamshedpur and Burnpur own collieries in Jharia. Reserves according to Dr. C. S. Fox are nearly 9,000 m tons, which will be exhausted in 50 years. Reserves of non-caking coal are 1,625 m tons. This is the most actively worked field and is humming with activity. Agriculture and forests have nearly entirely disappeared. Instead it is a sunken waste overgrown with weeds such as *bantulsi* and *ankhra.* A sad sight is the smoking waste near Jharia above the great underground fire, which has yet to be extinguished, and which has not been allowed to spread by sand blanketing. More and more sandstowing is being used now, and sand tubs coming over the ropeway from the Damodar bed are a common sight.

Bokaro to the west of Jharia is the best worked mine, for it mainly belongs to the railways. Here the seams are shallow, and one of them, the *Kargali Seam,* is nearly 100 feet thick, giving excellent coal. So open quarries are often met with. The activity here is not of the same degree as at Jharia. Much good metallurgi-

cal coal is used for railway engines. This should be stopped. Reserves of non-caking coal here are 1,300 m tons.

Karanpura: This is the last of the chain of coal fields strung along the Damodar valley. Only some mines in its eastern part have been opened up. Mainly the coal lies still untapped. Reserves are 9,500 m tons, of which non-caking coal is 3,740 m tons. The western part is dotted with peaceful villages and patches of forest. A new railway line is proposed to be built to it from Giridih via Hazaribagh.

Giridih: This is a small but very nicely worked mine. It belongs to the E. I. Railway.

Beyond Karanpura a chain of coalfields are arranged in a horseshoe fashion, ending in Talcher in Orissa. They are little worked. Their names are: Auranga, Hutar (in Bihar); Tatapani, Jhilmili, Bisrampur, Lakhanpur, Rampur, Korba, Raigarh (in M. P.); Talcher (in Orissa). A little to the west in this group are Singrauli and Umaria fields. *Umaria* produces 1 per cent of India's output. In this group may also be included the Rajmahal coal fields near Naya Dumka. Some of these fields will be opened up in near future.

A second group of Gondwana coal fields are found spread in a belt running from *Mohpani* north of Nagpur to very near the Godavari Delta. Of them only a few are producers of some note. All the M. P. coal fields have a reserve of about 1,700 m tons. Fields in the Wardha valley around *Chanda* produce about 4.5 per cent of India's amount. This belt passes through Hyderabad and here *Singareni* produces 1 per cent. The last of the series is *Beddadanol* in Madras north of Ellore.

A group of Mesozoic and Tertiary coal fields occurs in the Assam Darjeeling region. Here Disai, Nazira, Jaipur, and Makum are important in the upper Brahamaputra valley while a group of fields occur in the Garo and Khasi Hills. But all of them produce little coal. Much of the coal is not of good quality, but some good samples have been obtained. Recently good quality coal deposits in fairly big quantities were found in Garo Hills, which may easily supply all the needs of Assam Railways. Workable deposits of coal have also been found in Singrauli. Crushed coals are found south of Darjeeling. All these coals should be utilized in view of the smallness of our reserves. They could be easily

converted to electric power and then used. Special furnaces using powdered coal could also use them.

Other scattered coalfields are in Palana (Rajasthan) and Riasi (Kashmir). Mention may be made of the Neyveli *Lignite field,* 20 miles south west of Cuddalore in Madras. This field has been recently explored and the lignite found is of good quality. Further surveying will have to be done before opening it. The field covers 100 square miles and contains 500 m tons. of lignite. The deposits are difficult to mine because of underground water, and experts are examining the area from this point of view. Other lignite fields occur in S. Arcot, Trichinopoly, Tanjore and Ramnad, which need surveying. Lignite also occurs in Malabar. As coal is not found in this part of India, lignite in this region will prove highly useful.*

Reserves of Coal

Reserves of coal in India are 20,600 million metric tons, and lignite 3,000 million metric tons. Further exploration may reveal other deposits of coal, but there is little chance of finding any major coalfields which are still unknown. No proper survey of the coal resources of India has yet been made. According to another world estimate the total reserves in India of all coals are 87,000 m tons, which come to 1.1 per cent of the world reserves, a very insignificant reserve indeed for her extensive area and huge population and for her coveted aims and ambitions for future industrialization.** Workable deposits of Gondwana coal of all seams up to one foot thickness to a depth of 2,000 feet are 60,000 m tons. But for the same depth reserves of seams up to four feet and more, with an ash content of less than 25% are 20,000 m tons according to an estimate of the Geological Survey of India. Reserves of good quality coals are only 5,000 m tons and they could be further divided into caking coals, 1,500 m tons, which are used for metallurgy and non-caking coals, 3,500 m tons. So the reserves of caking coal are very meagre indeed. Further due to the wasteful processes of mining in India

* Lignite in South Arcot, Madras, by M. S. Krishnan, Indian Minerals, July, 1949.

** India's position with regard to her coal resources. N. N. Chatterjee, Presidential address, Indian Science Congress Nagpur, 1945.

50% of coal is lost in raising. This could be checked to a great extent by sand-stowing. Roughly the life of our coal reserves comes to 400 years, at the present rate of consumption.

Production of Coal by States in m tons for 1947 is given below:—

1.	Bihar	17.32	5.	Vindhya Pradesh	.57
2.	W. Bengal	7.65	6.	Orissa	.43
3.	Madhya Pradesh	2.59	7.	Assam	.36
4.	Hyderabad	1.16	8.	Rajasthan	.06

Consumption of Coal

The following table gives the various uses of coal per cent in India:—

Railways	32
Steam in textile mills etc.	25
Metallurgy	20
Domestic	10
Water Transport	4
Miscellaneous	9

Trade: In 1940 India exported 2 m tons of coal to Ceylon, Burma and Malaya, but there was a short supply during World War II and the following years. The position is better now. But India can never be a big exporter of coal. The following figures are revealing:—

Reserves of India .... 1.1 per cent of World
Production of India .... 2 „ „ „
„ per capita .... 2 maunds.

In 1948-49 India exported 1,132,100 tons of coal. Among the importers of Indian coal were Pakistan, Burma, Ceylon, Japan and Australia.

Iron Ore

This is the second most important mineral of India next to coal. The total quantity produced is far less than coal, but India boasts of large reserves of a very high grade of iron-ore perhaps found only in few countries. The reserves in Bihar alone are 2,650 m tons of 60 per cent first class ore.

Mr. P. N. Bose discovered the *Mayurbhanj* deposits in 1904. Subsequent exploration by various geologists led to the realization of the fact that in parts of *Singbhum* district and adjoining states of *Keonjhar, Bonai* and *Mayurbhanj* a region lying some 150 to 200 miles west of Calcutta, there exists one of the major iron ore fields of the world, in which enormous tonnages of rich ore occur near the top of hills. The most important range runs from near Rontha in Bonai state in a north-easterly direction rising 1,500 feet above the surrounding country, for about 30 miles, while haematite averaging over 60 per cent of iron, occurs along practically the whole length, with a few negligible breaks. Smaller ranges also contain good ore and follow a direction roughly parallel to the main ore.* This is the area which supplies ore to the blast furnaces of Jamshedpur and Asansol area. The chief producing centres are Gorumahisani, Badampahar and Noamundi.

The second important area where iron ore is being extracted for making steel, is in the *Mysore State*. Here it occurs in *Bababudan hills* in Kadur District.

The crest of the horseshoe-shaped chain of hills is formed nearly entirely of haematite with some magnetite. Of ores containing 60 per cent iron, there are 25 to 50 million tons, and of lower grade ores down to 55 per cent iron, there are at least 100 million and probably several times this amount.

Other iron ore deposits of Dharwarian age occur in Goa and Ratnagiri and in the Salem district of Madras.

Iron ores of Madhya Pradesh

Beyond furnishing a few tons to village smelters these ores have yet to be consumed by modern blast furnaces. In *Chanda* district ten separate deposits of good ore occur. The two best deposits are at *Lohara* and *Pipalgaon*. "The view presented by such a mass of almost pure specular iron" wrote Hughes, "it does not fall to the lot of many men to see surpassed, and those who possess the opportunity of visiting this place ought to do so and carry away with them the remembrance of having looked upon one of the marvels of the Indian mineral world." The Pipalgaon deposit he described as an excessively fine mass of red haematite,

*India's Mineral Wealth: J. Coggin Brown, pp. 106.

resembling that which occurs at Lohara if not having the same composition. The Lohara deposit is a leased reserve of the Tata Company. The average ore is stated to contain 61 to 67 per cent of iron. In the *Drug District* valuable ore deposits exist. They resist the action of denudation and rise in hillocks above the level of the surrounding country. The ridge which includes the *Dalli* and *Rajhara* hills extends for 20 miles and attains heights of 400 feet above the plain around. The mass of haematite which forms the crest of Rajhara hills contain 7½ m tons with about 67 per cent of iron. Similar ores are known to have a very considerable extension in *Bastar* in the *Antagar Tahsil*. A survey carried out in 1919 in Rowghat revealed the existence of 500 m tons of good quality iron ore at one place.

Over and above the rich deposits of Iron ores described, mention may be made of two minor resources. One of them are the so called iron-stone shales which occur in Raniganj and Jharia coalfield. Unfortunately they are rich only on the surface as a result of alteration. Lower down they are poor in iron content and may not be called iron ores. The Kulti furnaces were started assuming that the ore will be available from these resources, but these hopes were soon given up, and the works had to close down. They were re-opened only when the Mayurbhanj ores were discovered. These superficial ores have however supplied material for village blast furnaces from times immemorial.

The other source of iron are the laterite cappings rich in iron, occuring on the fringes of the plateau. But there is no chance of exploiting these poor ores, unless the rich ores mentioned earlier, are exhausted.

Thus on the whole, it is seen that India has very rich resources of high quality iron ore. Yet she only mines just over 2 million tons. This quantity may increase as the two Government sponsored steel mills, each with a capacity of one million tons of steel open up. But the limiting factor will always be our meagre resources of metallurgical coal. These must be conserved, and used only for matallurgy. Experiments should be conducted to make use of other coals for metallurgy. Hydel power development may solve the shortage of coal to some extent. The first steel electric furnace is to be set up soon at Bhadravati in Mysore, where forest wood is used at present.

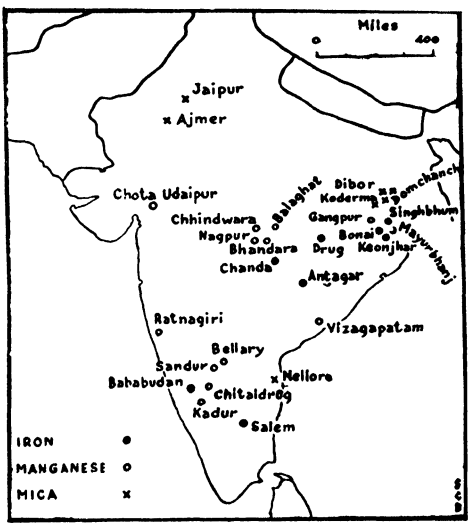
Production in 1,000 tons of iron ore by States in 1947 is given below:—

1.	Orissa	1,342	2.	Bihar	1,106
3.	Mysore	50	4.	Madhya Pradesh	.6

Manganese

This is one of the two minerals in which India holds a world position. It is only second to Russia in this respect. If Indian steel industry develops, India may very soon outstrip Russia.

World's demand of manganese ore fluctuates with the need of Iron and Steel Industry. This has increased from 13 million



Map 36

tons in 1,890 to about 100 million tons to-day. Consequently the need for manganese has also increased, for manganese is essential for steel production. But this has been partly disproved by Germany during the 2nd World War. Other uses of manganese are decolourizing glass and use as paint drier.

India is a great exporter of manganese ore. Her chief competitors are Russia and Brazil. India led up to 1928, after which

Russia displaced her from the first position in 1929 by producing 1,230,000 tons against 994,279 tons by India. Since 1938 the production has rapidly fallen since the pre-war boom.

Year			*tons*
1938	....	....	992,795
1943	....	....	595,347
1944	....	....	370,980
1945	....	....	210,230
1946	....	....	252,916
1947	....	....	451,034

Our chief buyers are U. K.—40% Belgium—21% France—17% U. S. A.—15% and Holland, Germany, Italy and Japan with small percentages. U. S. A. has increased her purchases in recent years.

Manganese seems to be losing importance as a strategic mineral in war, as is shown by the fact that in the first World War the German steel deteriorated very seriously towards the end of the war, owing to manganese famine, whereas in this war the Germans had learnt to make excellent steel with their own low grade manganese ores.

Inspite of this development in Germany, high grade manganese ores were essential for the steel industries of all other nations at this time. Difficulties of transport both by sea and by rail in India were acute during the war and had the effect of greatly reducing the export of Indian manganese and of encouraging the development of manganese mining in Brazil and S. and W. Africa. On the whole the effect of the war on the Indian manganese industry was probably unfavourable, but the industry is again in a flourishing state, on account of the present critical world situation, and the possibility of a third world war.

Distribution. The most important and the most productive area of manganese ore is the central part of *Madhya Pradesh*, in the districts of *Nagpur, Chhindwara, Bhandara and Balaghat.* This area produces 61 per cent of the Indian production. Here manganese ore deposits occur as small hill ranges and lone hillocks. One such deposit lies in a 12 miles long hill in Nagpur. Here

* H. Crookshank, Presidential Address, Geology and Geography, Indian Science Congress, Bangalore 1946: "War and the Indian Mineral Industry."

the *Mansar* mine is important. Another deposit, 6 miles long is found in *Balaghat*. Here new deposits have been found at *Tirodi* by magnetic prospecting in 1949. Manganese deposits also occur in *Jhabua*.

Madras produces much of the Indian producion. The ores are found at *Vizagapatam, Sandur* and *Bellary*. The Vizagapatam ore at *Kodur* was first to be mined in India. The biggest deposit in this area is at *Garbham* (500 yards long and 50 yards thick). A new deposit has been found near *Raigudda* near this area on the Raipur-Vizagapatam line.

Sandur and Bellary ores are of a different nature and are situated in the wedge of Madras State between Hyderabad and Mysore.

Bombay produces some of manganese ore. The ores occur in *Panch Mahals, Chhota Udaipur, North Kanara* and *Ratnagiri*. Exploitation has not begun in the last place.

Mysore produces a little amount of the Indian product. The mines are scattered in *Chitaldrug, Kadur, Shimoga* and *Tumkur*.

Bihar and Orissa contribute an ever increasing quantity, and the importance of these deposits at *Gangpur, Keonjhar* and *Singhbhum* is increased by their proximity to the steel centres of Jamshedpur and Asansol.

Banswara in Rajasthan is also producing manganese.

A great drawback of the Indian manganese ore industry is that a very small percentage of the ore is transformed to Ferro-manganese in India. All of it is thus exported raw. This is a distinct loss to the country. Production of Ferro-manganese first started in India in 1915 by Tatas and Bengal Iron Co. But it was only to meet local demands. It never exceeded 50,000 tons. Presence of phosphorous in Indian coke seems to deteriorate the quality of Indian made ferro-manganese, and its lack of demand in the foreign market. But research should be conducted in this line and the Government's high priority aim should be to export ferro-manganese and not raw ore. This will yield much revenue to the country.

Production of manganese ore in 1,000 ton by States for 1947 is given below :—

1.	Madhya Pradesh	274	5.	Bihar	18
2.	Orissa	91	6.	Rajasthan	1.7
3.	Madras	45	7.	Mysore	.6
4.	Bombay	20	8.	Madhya Bharat	.5

Mica

This is the fourth most important mineral of India, though not in weight, but in value. India has a monopoly in possessing world's most valuable resources of mica of very good quality and (similar to the tea industry) has developed a class of labour which is adept in splitting mica, which makes her the sole exporter of split mica. The annual export in cwts. is given below :—

1938	....	123,169
1943	....	159,581
1944	....	139,392
1945	....	128,306
1946	....	209,881
1947	....	192,671

Mica finds its chief use in the electrical industry as an insulating medium. For this and other purposes, its perfect cleavage, transparency and lack of colour in thin sheets, flexibility, toughness and non-conductivity of electricity and heat, resistance to temperature changes and chemical decomposition, render it indispensable. Mica mining has indeed grown with the advance of electrical engineering and the development of motor transport, aeronautical science and radio-telegraphy. Sheet mica is also used for the fronts of stoves and furnaces and for lamp chimneys etc.

The mineral is employed as a drying powder for sticky compositions, such as roofing materials, in the manufacture of pipe and boiler lagging, as a decorative substance for wall papers and as lubricant.

In World War II one maund of semi-finished mica was used in a four engined bomber. The war time demand was very large for the best qualities of mica. The Bihar mine production was improved by more careful dressing of the raw material. Increased Rajasthan production of good quality mica helped greatly also. The situation was, however, really saved by a great development

of production of high grade mica in Brazil, sponsored by American capital and engineering skill, and forced upon them by war. So Brazil is sure to lose importance in mica production in the post-war period.

A greater danger to the Indian mica trade is the development of substitutes. Owing to war time shortage, specially in Germany, intensive research was carried out with a view to develop suitable mica substitutes, and a good artificial insulater is now available for use instead of mica in the segments of commutators, and wrapping mica is no longer used in the best quality sparking plugs. Germany succeeded in using substitutes for mica over a wide field in the electrical industry.

The commercial value of mica is greatly affected by the ease with which it can be split into flat sheets, hardness, flexibility, colour, freedom from specks, stains and inclusions and size of the sheets. After the removal of broken and flawed pieces, the sheets are trimmed, the product being then known as 'dressed block'. The wastage in this process alone amounts to between 70 to 80 per cent. The dressed mica is next sorted into various market sizes. After sizing comes the grading process, in which the sheets are classified according to their freedom or otherwise from stains and inclusions. Over 80 per cent of the exports, however, consist of splittings, made by separating the smaller sizes into the thinnest possible films, one thousand films to the inch being the usual standard. It is done by women using a sharp-pointed knife and trained in this work from childhood. The pre-eminent position they have attained in this craft is shown by the foreign block mica which is now sent to India from other countries, to be exported again in the form of fine splittings.

Bihar Mica Belt: This great belt is 12 to 14 miles broad and 60 miles long. It runs in an E. N. E. direction from Chauparan to Jhajha in Gaya and Hazaribagh districts. The country rock formed of crystalline gneisses is penetrated by mica-bearing pegmatite veins of varying lengths upto a maximum of 1,500 feet, with steep dips and thickness from a few inches to over 100 feet. Mica blocks of huge sizes are found along them in pockets. Primitive methods were used in the past in mica mining, many of the workings being merely winding holes following the veins from one block to the next. Many of them were shallow workings but some like the Buria (Domchanch) went winding

500 feet into the bowels of earth. Some mines are being worked on modern methods now as the Khalaktambi Buria (Dibor). The Bihar mica belt yields nearly 80 per cent of Indian mica.

Nellore Mica Mines of Madras: This belt is sickle-shaped, tapering to the south-east and north-north-east. The central portion carries most of the mines. Sheets, lenses and large masses of pegmatite occur frequently in the country rock. The mica has a green colour and therefore sells at a lower price than the so-called 'Bengal Ruby' variety of Bihar.

Rajasthan Mica Mines: The mica produced in this area is supposed to be of inferior quality and takes the smallest share in mica production in India. It produced useful amounts during war.

Work of Joint Mica Mission in World War II. In 1942 the Geological Survey of India handed over the buying of mica to a Joint Mica Mission sent out by the British and American Governments. Utilization branches were set up in Kodarma, Gudur (Nellore) and Ajmere staffed by mining engineers. Stores and equipments were obtained from America under lease-lend by the Joint Mica Mission. The Mission decided that Bihar, which produced a higher percentage of first class mica, than either Nellore or Rajasthan should have first pick of equipment. Thus Rajasthan and Nellore got what was left over after Bihar had its pick. This was somewhat unfair as Rajasthan gave a good contribution.

Mica Poaching. Strangely enough the production statistics of mica is thoroughly unreliable. The exported quantity is always higher and sometimes even double the production figure. Special rules enforced in 1930 slightly lessened the gap between the two sets of figures. However, in 1934 the export figures exceeded the production by 66 per cent. Individual mines take great precautions. The pit-heads are locked and guarded while the product is hauled up by a separate passage after being packed in bags, sealed and weighed. Yet the bags are missing now and then.

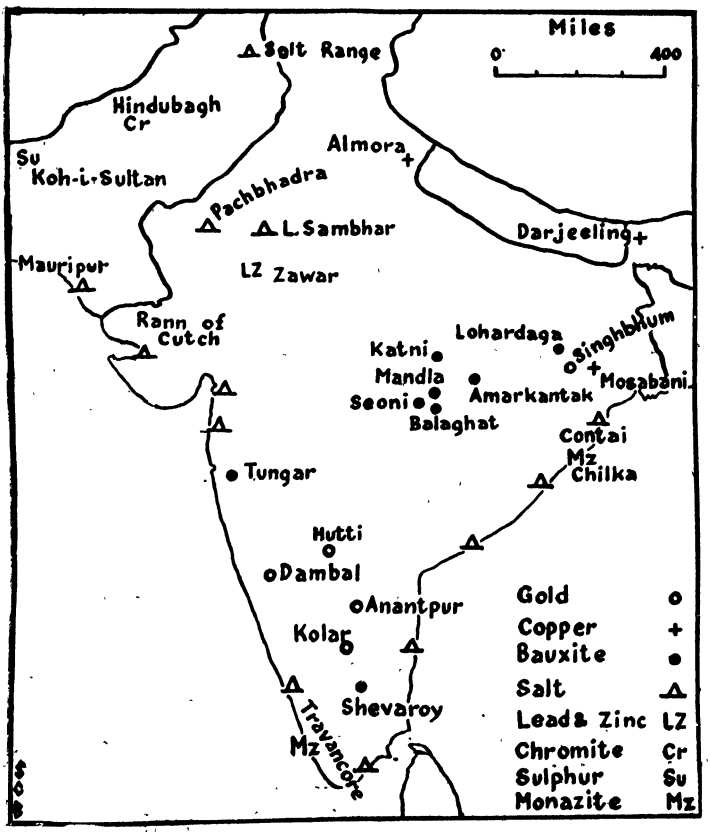
Mica export in 1947 consisted of 1,47,079 cwts. of splittings, 14,292 cwts. of blocks and 31,300 cwts. of scrap and waste.

Chief buyers of Indian mica in 1947 were:—

1. U.S.A.	105,550 cwts.	5. Canada	1,798 cwts.
2. U. K.	76,180 „	6. Sweden	1,413 „
3. Australia	2,492 „	7. Italy	1,400 „
4. France	2,312 „	8. Belgium	1,144 „

Gold

This mineral occupies the fifth position in India, as regards value. Alluvial gold is found in the sands of many Indian rivers and the metal was collected in small quantities by village folk from the Brahmaputra Valley in Assam, from the rivers of Singhbhum in Bihar, from the Indus Valley in Gilgit and Baltistan in Kashmir,



Map 37

from Garhwal and Bijnaur in U. P. and from Ambala in Punjab. But except for Singhbhum, the mother load (the original gold bearing quartz veins) was never searched or worked, and also the regime of rivers (dry in winter and heavily flooded in summer)

was not conducive to tranquil conditions necessary for the accumulation of thick gold-bearing gravel deposits.

In South India, however, gold was sought after more systematically and workings are found all over Deccan, where ever gold-bearing quartz veins occur in the Dharwar rocks (old sediments deposited in Dharwar age). The most important of these are found in the *Kolar Gold Field,* which is the only big producer of gold in India at present. It is situated in the eastern part of Mysore State, on a plateau 2,800 feet above sea-level. In old times some shafts sunk into the field went up to 300 feet depth. Modern mining began in 1871, and at present workings in the Champion Gold Vein have gone down over 8,800 feet below the surface. The Dharwar schists here form a narrow belt 50 miles long, of which the productive portion is only 5 miles. The mines are electrified, and one of the best managed metal mines of India. Of course, the gold won pays all the cost. It has been found that the gold content of the vein has remained fairly constant as the mines have gone deeper, perhaps it is slightly richer. On the surface are the crushing mills in which the quartz is pulverized. The main quantity of gold is then obtained by washing, and the remainder is obtained by chemical processes.

Other places where gold-bearing veins in Dharwars exist, which were worked in the past, and again in the present times by modern methods, and later abandoned are

(i) *Hutti* in Hyderabad: Here the mines reached a depth of 3,500 feet before they were abandoned in 1920.

(ii) *Dambal, Dharwar district, Bombay*: mines were worked up to 950 feet, and abandoned in 1911.

(ii) *Anantapur district, Madras*: Mines went down up to 1,150 feet and then abandoned in 1924.

(iv) *Chotanagpur*: Here veins and old workings are very numerous, specially in Singhbhum, and small amounts of alluvial gold occur in most of the streams, where its extraction by primitive tribes of Singhbhum is still carried on.

In 1890 a gold boom started for this region but gradually fizzled out. Perhaps a more intensive survey may yield good result, though up till now none of them has been hopeful.

Production of gold in India is given below in ounces.

1938	....	....	321,138
1943	....	....	355,228
1944	....	....	188,206
1945	....	....	168,366
1946	....	....	131,775
1947	....	....	171,705

In 1948-49 production of gold in Mysore was 172,589 oz. Mysore also produced 14,382 oz. of silver in the same year. Madras produced 7 oz. of gold and U. P. 2.4 oz. in 1947.

Copper

Copper ores were smelted in prehistoric times at various places in the Deccan Plateau as well as in the Himalayas. But this industry shrank to very small proportions in recent times. The miners were unable to cope with the flooding of mines. The cost of production of metal was so high, that it could not compete with imported copper. The old village industry has persisted on a very small scale in remote areas of the Himalayas in Almora and Darjeeling, but now it depends upon imported copper sheets.

Singhbhum Copper Belt. This is at present the best known and active copper producer. It is a curved zone passing through Kharsawan and Dhalbhum and ending on the borders of Mayurbhanj. The whole belt contains ancient mine workings. The ore body contains sulphides of copper and iron. Work started in 1862, but full scale work only began when in 1924, the Indian Copper Corporation Limited was formed. In 1930 the company opened the first yellow metal rolling mill of India at *Moubhandar.* Three mines are worked at present at *Mosabani, Badia and Dhobani.* Since ore winning operations started in 1929, up to the end of 1947 a total of 5,727,500* tons of ore was treated for the production of 106,060 tons of refined copper. So the grade of the ore was 2.2 per cent. Output is nearly 800 tons per month and all is sold in India. From Ghatsila on the B. N. R. a siding goes to the works. There are further possibilities of developing the belt and increasing production.

* Patna Handbook, Indian Science Congress, 1948, pp. 110.

Extensive ancient copper workings exist at *Barganda, Hazaribagh District, Bihar,* but attempts to open up the area have failed.

Mention has already been made of low grade ores smelted by local people in *Darjeeling, Almora, Garhwal and Kangra,* but the value of the deposits concerned is quite problematical.

Six tons of copper ore was raised in *Chhota Udaipur in Bombay* in 1946.

The *Khetri* mines of *Jaipur State* contain many old workings, and recent survey has revived hopes of opening up these mines. Copper ore deposits are found in Alwar adjecent to Jaipur. Both these areas were fully investigated in 1949. Copper ore similar to Singhbhum also occurs in *Chitaldrug, Mysore.*

India produces a very small fraction of her needs of copper and meets them by import. A thorough survey is necessary to open up new areas, for greater production of this strategic mineral. Production figures of copper ore are given below in tons:

1938	....	....	288,127
1943	....	....	359,789
1944	....	....	326,017
1945	....	....	329,325
1946	....	.. .	352,718
1947	....	....	323,035

5,931 tons of copper metal was produced in India in 1947.

Lead, Zinc and Silver

India produces very little of the above non-ferrous metals. They depend entirely upon imports, the nearest source being the Bawdwin mines of Burma. When Japanese overran Burma in 1942 the Government of India asked the Geological Survey to explore the *Zawar* area in Udaipur. Very extensive old workings are found here. The operation was carried out with commendable speed. But no rich ore, which may give quick returns, was found, and the result was considered inconclusive. A load of 500 feet length and 10 feet breadth with 10 per cent metal was located. Another smaller but richer load, with native silver in places was discovered. A very big load with 4 per cent metal was also found. The Government sold back the area to the State, which was later bought by private concerns, but no work was begun. It has been

investigated again in 1949. Some galena (lead ore) is found in Jaipur and Marwar, the production in 1947 being 839 tons. Silver is produced in association with gold in Mysore. The production in 1948-49 was 14,382 oz.

Wolfram

With the loss of Burma, from where wolfram was imported, India opened up her own resources at the old workings of *Degana* in *Rajasthan* and *Kalimati* in *Bihar,* and produced 79 tons in 1942. But the production fell to only three tons in 1947.

Monazite and Ilmenite

Monazite sands are known to occur on the sea coast near Chilka, Godavari Delta, Tinnevelly and in much larger amounts in Travancore. Not much is known about the source of this sand. Much survey is required to locate it and then find out our resources in the rocks so found, and in the sand deposits.

2,000 tons of monazite were produced in 1918 for making gas mantles. This demand ceased and monazite production stopped in 1925. Production started again as a by-product of ilmenite which had an increasing demand. The production was maximum in 1938 when 5,221 tons of monazite was produced, as a by-product of 252,000 tons of ilmenite. In 1947 Travancore produced 260,955 tons of ilmenite. Production figures of monazite are not published.

The strategic importance of monazite lies in the fact that it contains a valuable percentage of thoria which may be used like uranium as a source of atomic energy. The present government is fully alive to the necessity of developing atomic power and has appointed eminent scientists for this purpose. An Atomic Energy Commission has been formed. Rewards have been declared for the discovery of new deposits of Uranium.

Mineral Oil

India possesses extremely inadequate supplies of mineral oil. At present the only productive oil fields are in Assam. The total production of petroleum in India was 65.2 m gallons in 1947, as compared to 64.9 in 1946. The production in 1948-49 was 66.1 m gallons. India consumes nearly 700 m gallons of petroleum

every year, and so her production is less than 10 per cent of her needs. Naturally, therefore, efforts are being made to increase production. Search for new oil fields has yet been fruitless. In Assam no new successful well has yet been found. The latest effort at Tiru Hills has also failed. Plans are in hand to drill test wells at Masimpur and Rokhia.* Oil seepage and gas show is observed all along the western edge of hills running along the eastern frontier of India. But either the structures are too tightly folded and unfavourable, or do not contain oil further west, where gentle folds occur. Search still continues and there is hope of finding oil in new areas of Brahmaputra Valley, Cachar and Tripura. Searches in Saurashtra have not yet yielded any results. Chances do not seem to be rosy of finding oil in other parts of Himalayan foot-hills.

A proposal has been made to erect a plant for producing 30 m gallons of synthetic oil from inferior coal in some parts of the Damodar Valley coal fields. According to the Geological Survey of India, sufficient low grade coal existed in Raniganj, Bokaro and Karanpura to erect a 300 m gallon plant at either of these places. It will consume 7 m tons of coal per year. Water requirments of such a plant could also be met from the Damodar.

Power alcohol is another substitute of petrol. The present capacity of distillaries in U. P. is about 10 m gallons. But actual production of power alcohol in 1949 was only 4.2 m gallons, and was expected to be 6 m gallons in 1950. This could be raised to 40 m gallons by using all the sugar molasses.

Salt

Salt is produced from two kinds of resources:—

(a) *Salt Lakes* in the desert; (b) *Sea salt.*

The following table gives the production of salt in thousand tons:—

1946	....	....	1,485
1947	....	....	1,540
1948	....	....	2,335
1949	....	....	2,685

* J. Coates, presidential adress, Indian Science Congress, Poona.

The production was expected to be about 3,200 thousand tons in 1950.

Lake salt is mainly obtained from *Sambhar lake* in Rajasthan, the production being nearly a quarter million tons per year. Some salt is also obtained from *Pachbhadra*, west of Jodhpur.

Sea salt: This is won in Madras and Bombay. There are nearly 50 centres in *Madras* scattered along 1,600 miles of coast from Ganjam to Malabar. Working season coincides with dry period, as sun rays are used for evaporation. In *Bombay* there are works within 30 miles of the city, *Dharsana* and *Chharvada* in gulf of Cambay, *Port Okha* in Kathiawar, and the *Rann of Kutch*. Many new works have been opened here and production has gone up.

Recently the Contai coast in W. Bengal has been surveyed for salt production and declared fit. Schemes have been made to make W. Bengal self-sufficient in salt by 1951-52, when she may produce 150,000 tons of salt.

The import of salt from abroad has gradually decreased from 1915 onwards. The total consumption of salt in India is about 200,000 tons. Hence it seems that there will be no need of importing salt henceforth.

Gypsum

Gypsum is found in large quantities in Rajasthan, Kashmir and Trichinopoly. New deposits of gypsum were found in Jodhpur and Haler in Saurashtra in 1949. Its importance for India has increased, for on it will depend the ammonium sulphate works to be started at Sindri. All other subsequent development of this fertilizer will depend upon our resources of gypsum.

The *Nagaur* deposit in *Jodhpur* and the *Jamsar* deposit in *Bikaner* are important. Production of gypsum in 1946 was 48,669 tons. In 1947 it went up to 50,569 tons.

Phosphates

Their importance is due to their use as fertilizers. *Apatite* is the most important phosphate mineral, and occurs in many

places in India. The most important area is a belt surrounding the *Singhbhum* copper belt in Bihar. Here apatite was produced from *Sungri* and *Nandup areas.* It also occurs in the Bihar (Hazaribagh) mica belt, Nellore, Raniganj and Giridih The production of superphosphate fertilizers from mineral phosphates like apatite should be started in near future to increase our agricultural produce. 243 tons of apatite was produced in Trichinopoly in 1946, and was raised to 853 tons in 1947.

Chromite

Chromite occurs in Mysore (Shimoga and Hassan districts), Singhbhum in Bihar, Keonjhar in Orissa and Kistna in Madras. Chromite is used in making chrome steels, refractory materials and chromium salts.

Production in 1947 was 34,717 tons compared to 24,201 tons in 1946.

Bauxite

Time is near at hand when the importance of bauxite will suddenly increase, for aluminium which is obtained from it is gaining popularity, for many of its good qualities such as light weight, immunity from corosion and good conductivity of electricity. Its use for making bodies of aircraft is noteworthy, in view of the new aircraft industry to be established in India.

Large deposits of bauxite occur in various parts of the country, specially as altered rocks on the tops of trap hills. The largest deposits are near Jubbulpore. Extensive deposits occur on the *Ranchi Plateau.* A quarry here at Lohardaga is supplying the ore for the new Anupnagar Aluminium works near Asansol. Lohardaga will also supply the ore to the alumina works at Muri. *Tangar hills* only 30 miles from Bombay contain 750,000 tons of ore containing 49 per cent metal. Other places are Balaghat, Mandla, Seoni, Amarkantak and Nandgaon in Madhya Pradesh and Nagod in Vindhya Pradesh. New deposits estimated at 300,000 tons have been discovered at Sambalpur. They will be used for producing aluminium by using electric power obtained from Hirakud after its completion.

With the development of hydro-electric power in other parts of India production of Bauxite will increase by leaps and bounds.

Production in 1947 was:—

1.	Jubbulpore (Madhya Pradesh)	8,196	tons.
2.	Ranchi (Bihar)	5,878	„
3.	Belgaum (Bombay)	3,160	„
4.	Nagod (Vindhya Pradesh)	1,303	„

Diamonds

Vindhya Pradesh is the chief diamond producing region of India, where Panna and Charkhari have diamond mines. Production here in carats is given below:—

	1946	1947
Panna	1,096	576
Charkhari	8	708

Recently a new diamond bearing volcanic pipe was discovered at Majgawan, 12 miles from Panna town.

CHAPTER—XI

ANIMAL PRODUCTS

Various kinds of products are obtained from animals, domesticated or wild. India too has great resources of animal products. Yet they are not fully developed.

Cattle

The most important group of products are obtained from cattle. India boasts of the largest cattle population in the world. But unfortunately the production of milk etc. from them is very low. Indian cows have been called "tea-cup" cows, for they give very little milk.

The following table gives the number of cows and buffaloes in India in lakhs :—*

	Cows	Buffaloes	Total
1945	136	41	177
1939	138	40	178

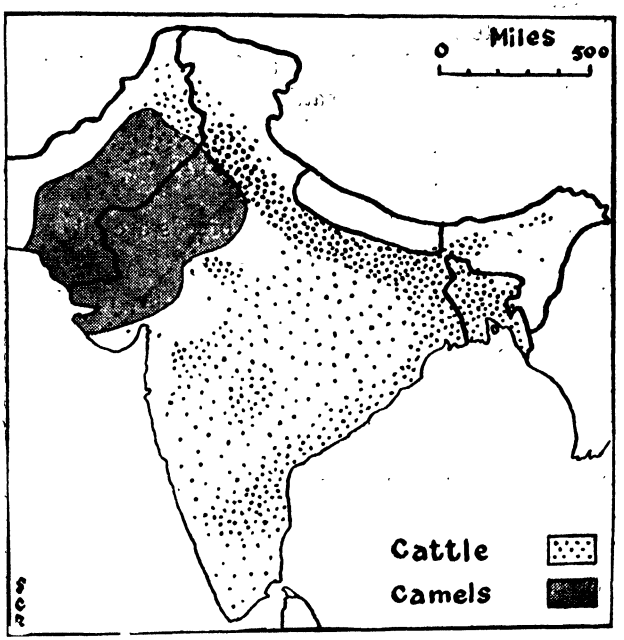
The production per capita of milk in India, is as low as six ounces, though in the total amount of milk produced, India is only second to U. S. A. While a cow produces near 350 gallons of milk in one year in Europe, she produces only 30 gallons in an year in India.

Animal Husbandry is not receiving anything like the attention it deserves, compared with other countries. The village cattle are non-descript, weak, puny animals, easily susceptible to diseases, specially epidemics. They are uneconomical to keep, and their superfluous numbers form a big drain on the fodder resources of the country.* There is no planned cattle breeding in the village greens, where inferior bulls roam about in the midst of cows. Diseased and old cattle are kept in Pinjrapoles, at a great cost. On the other hand slaughtering is indiscriminate, and very often cattle of good breeds, or good milch cows are slaughtered. A

* F. A. O. Year Book of food and agricultural statistics, 1948.
* National Planning Committee: Animal Husbandry, pp. 33.

check upon slaughtering should be made, and such things should not be allowed. All these factors lead to the general deterioration of the animals.

Cattle diseases: It is of utmost importance for such a huge cattle population to be protected from epidemic and other diseases. The Central and Provincial Veterinary Department of the Government have been giving attention to the subject, and deaths from epidemic diseases are showing a fall, there being nearly 40 per cent improvement. Muktesar Research Institute in Kumaon hills,



Map 38

U. P. has produced a vaccine which gives immunity from rinderpest, deaths from which have fallen from 2,78,000 in 1925-26 to 1,38,000 in 1935-36. More attention has also been given to animal nutrition, and a research station has been established for this purpose at Izatnagar in U. P. Work on this line was already being done in Bangalore.

Cattle Breeding:* Very little has yet been done in this direction, and without proper cattle breeding there is little hope to

*B. C. Burt: Agriculture and Animal Husbandry in India.

improve the livestock of India. Breeding work has followed three main lines:

(a) The breeding and supply of suitable stud bulls;

(b) The establishment of definite breeding areas where intensive work is carried out under premium bulls schemes or other suitable methods:

(c) The systematic castration of scrub bulls.

The number of approved bulls at stud is continuously increasing, but is still far too small. It has been decided to set up State Livestock Improvement Boards, which will continue to help in the matter.

A new cattle breeding farm has been opened in Allahabad, where Red Sindhi-American cattle breeds are being developed. Artificial insemination is also being used to improve breeds. A bullock rearing farm is also being opened in Ganga Khadar, one of the newly reclaimed regions of U. P.

Pedigree herds of valuable Indian breeds are given below: —

Breed	*Herds maintained at*
Sahiwal	Delhi, Ferozepur, Nagpur, Ranchi
Hariana	Karnal, Hissar
Gir	Bombay, Bangalore
Kankrej	Chharodi, Baroda
Kangyam	Hosur, Palayakottai.

Dairying: Inspite of the largest population of cattle, India is very backward in dairying. The low production of milk per capita has already been referred to. The most important dairying industry is the production of *ghee* or clarified butter. This is done in villages from where it comes to cities for being sold. There is a small export of ghee to Indian populations living outside India. Punjab, Western U.P. and N. Bihar are important producers of ghee. Vegetable ghee is gradually gaining importance in India. It is sold as such in large quantities and is used extensively for adulterating pure ghee, which is sold at very high prices now.

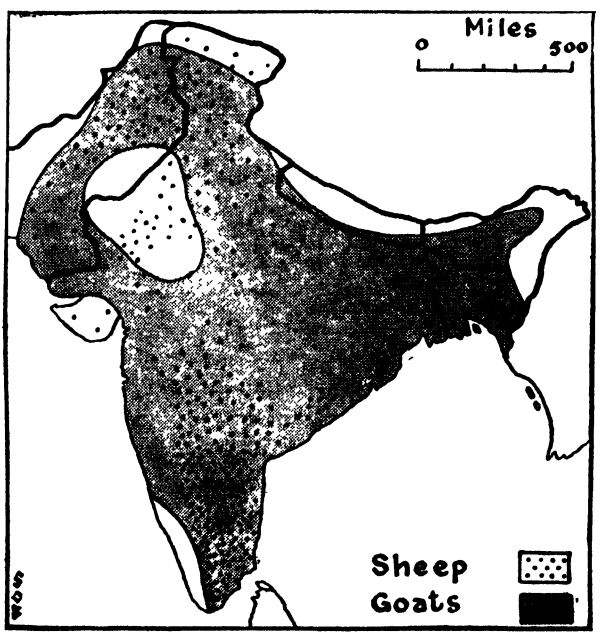
There are very few modern dairy farms in India producing butter, which is consumed by townfolk only, for in villages local butter is always in surplus and is transformed to ghee. There are only a few modern concerns manufacturing tinned butter. Other dairy products such as cheese, condensed milk and powdered milk are produced in negligible quantities. They are imported from

New Zealand and Australia. Bombay, Bangalore and Aligarh have dairyfarms and manufacture dairy products.

A central dairy institute and farm for the purpose of instruction in the principles of dairy farming, and European dairy methods has been maintained by the Central Government at Bangalore. A great immediate problem is that of a better supply of milk to cities. This can only really be solved by taking cows out of the cities and sending in milk from suitable country areas. This calls for immediate experimental work on processing and transport. A milk colony has been established in the suburbs of Bombay city, and another at Haringhata near Calcutta, with an ultimate aim to supply milk to these cities.

Goats

Goats are found nearly all over India in dry Rajasthan and



Map 39

in humid Assam, in the Himalayan mountains and in the great plains. The number of goats in India was 46 lakhs in 1945, as

compared to 50 lakhs in 1939. This is the largest number of goats any country has in the world. Besides supplying meat, goats supply skin, which is an important item of export. Goat breeding is done in villages and herds of live goats are brought to towns for slaughtering. The majority of people, not taking beef, goat meat is in great demand for non-vegetarians. Goat milk is also used.

Sheep

The number of sheep in India was 38 lakhs in 1945 and 42 lakhs in 1939. Besides supplying mutton and skin, sheep also supply wool. Sheep found on the Deccan Plateau yield a very rough quality of wool, which is used for making rough blankets. Good quality wool is obtained from sheep living in the Himalayas and Kashmir. Sheep-farming on scientific lines is practically absent, and there are no standard breeds. Much wool and woollen goods are imported by India, but some raw wool is exported. Wool worth Rs. 317 lakhs was exported in 1948-49, as compared to 2,44 the year before and 62 in 1938-39.

Hides and Skins

India is a leading exporter of hides and skins. The following table gives the export in lakhs of rupees:—

1948-49	....	....	18,29
1947-48	....	....	21,98
1938-39	....	....	11,32

Tanneries are located mainly in Kanpur, Calcutta and Madras.

75 per cent of the hides and 50 per cent of kid skins are tanned and the remainder are exported raw. Germany was a major buyer of hides and skins before war. While U. S. A. buys two-thirds of raw skins, U. K. purchases three-fourth of tanned skins. Tanned skins are mainly exported by Madras. India supplies near 15 per cent of the goat skins of the world. Chrome tanning is done in Kanpur. Calcutta and Madras make shoe uppers, which are exported to Burma, Malaya, Iraq, Iran and parts of Africa. Glaze kid for local consumption is now manufactured in India.

Live-Stock Statistics

The following table* gives the number of live-stock by 1,000 heads:—

		1939	*1945*
Cattle	....	137,974	136,369
Baffaloes	....	40,130	40,610
Goats	....	50,270	46,469
Sheep	....	41,505	37,731
Pigs	....	2,704	3,704
Asses	....	1,187	1,130
Horses	....	762	556
Camels	....	616	655
Mules	....	49	44

Poultry

Poultry-keeping has received a fair amount of attention in all the states. All agricultural colleges maintain a poultry yard, and most State Governments maintain poultry breeding stations. The Government of India has published an elaborate report on the marketing of eggs, after an elaborate survey in the whole country. The importance of poultry in India may be judged from the fact that, domestic connsumption apart, hen eggs and duck eggs are sold every year to the value of over five crores of rupees. The value of the birds themselves is estimated at 7½ crores of rupees.

The introduction of superior breeds has, so far, produced satisfactory results in grading of the 'Deshi' breeds. Government Institutions have introduced cockerels of improved breeds with advantage; and have distributed selected eggs for hatching, and selected chicks for rearing. Many Missionary Institutions and Y. M. C. A. centres have undertaken poultry work as a characteristic activity of the rural reconstruction scheme. The work at *Marthandam, Travancore* is commendable, not only for producing and distributing improved poultry, but also educating the villagers all round. The Government Poultry Farm maintained at Poona is a good example of how a poultry station can be started and managed, and attention may be drawn to the provision made here for the training of future poultry breeders. The E. Punjab has a

* F. A. O. Year Book of food and Agricultural Statistics, 1948.

central poultry station at Gurdaspur. Indigenous fowls are selected and graded up, foreign breeds have been introduced, and both indigenous and foreign breeds are multiplied and distributed to the villagers.*

Per capita consumption of eggs and bird-flesh is very low in India, and much scope lies for the improvement of this food supplying industry.

Bee-Keeping*

The use of honey as an article of diet and as a vehicle for Ayurvedic medicines, is well known. Honey is still mainly gathered by some tribes from bee-hives inhabited by wild bees in the forest. This collection is made in many parts of Madhya Bharat and Sunderbans in W. Bengal.

Apiaries have been introduced in several countries, where domesticated bees have replaced the wild bees and bee-hives are kept near dwelling houses. Bee-keeping may be considered as a cottage industry, in localities where food is available in the shape of flowers for the bees to gather the honey from, in all months of the year. Bee-keeping has been successfully established in several parts of India, and proposals are under consideration for the extension of bee-keeping.

Bee-keeping and the distribution of hives has also become a regular feature in several Y. M. C. A. centres. The work of the Govt. entomologist section deserves special mention. Careful investigation and study is carried on at the insectory at Coimbatore into the habits of wild and domesticated bees. Beehives have been introduced in several villages in surrounding districts and demonstrations are given from time to time. The honey produced from apiaries is pure and fetches a high price. The supply is not equal to the demand. Bee-keeping is specially practiced in many hill stations. Mahabaleshwar in Bombay is an improtant bee-keeping centre.

A vast scope exists to augment our resources of food by producing more honey, by inculcating habit of bee-keeping.

Silk and Allied Products

Silk, tasar, endi, and *muga* are various types of silk like fibres

* National Planning Committee: Animal Husbandry, Dairying, Fisheries and Horticulture.

which are obtained from insects reared on the leaves of various types of trees. Of them the most important is the silk worm which feeds on the leaves of mulberry trees.

In Murshidabad District (W. Bengal) silk was reared in the past, specially in the times of the East India Company. This silk industry has now declined and many remains of old Silk Kuthis can be seen to-day in this district. Silk is now reared in Mysore and Kashmir. Another area in Bengal was Bankura District, where Bishnupur and Sonamukhi even today have many silk looms working, depending on imported silk. The mulberry tree grows nearly in every part of India. The silk worm thrives at a temperature of65° to 75° F., and humidity of 70 to 80 per cent. So there is no danger of the worms being killed by extreme cold, as is the case in Japan, where cocoons are kept in artificially warmed rooms. A great difficulty here is the prevention of pebrine disease of the silk worms. 25 maunds of mulberry leaves are enough to produce one maund of raw cocoons. The production of raw silk thus comprises the following:—

(i) Cultivation of mulberry trees,
(ii) Production of silk worm eggs,
(iii) Rearing of Worms,
(iv) Reeling of cocoons into raw silk.

The mulberries could be grown in small grove in villages, or in home compounds. They are also useful as windbreaks, thus serving a double purpose. For bigger produce, plantations are necessary. Other requirements are trays, nets, spinning trays, knives and disinfecting material such as copper sulphate and sulphur. The industry is not yet well planned. Apart from giving employment, it will increase national wealth, and thus increase per capita income.

Assam is a very important producer of tasar, endi and muga. It is also produced in parts of Chotanagpur.

Production of raw silk in 1944 and 1945 was 2,600,000 lbs. and 3,000,000 lbs. It was in great demand for making parchutes. Tasar production was about 2,500,000 lbs. for these years.

Fisheries

The fishery industry may be divided into four heads:—

(a) *Inland Fishery,*
(b) *Coastal Fishery,*

(c) *Deep-Sea Fishery,*
(d) *Pisciculture.*

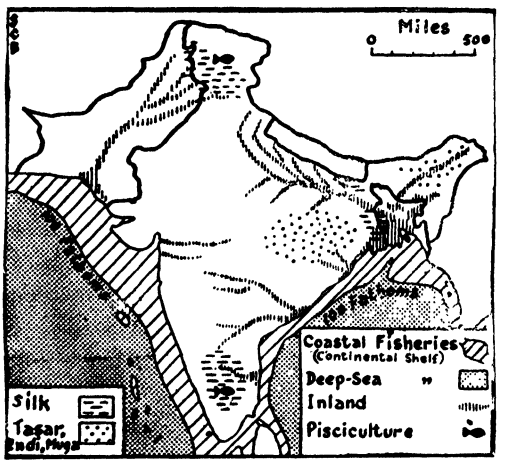
The importance of fisheries lies in the immense potentiality of this article to increase the food resources of this country. There are now five lakh fishermen in India. Notwithstanding the prevalence of vegetarianism, large numbers of every caste and creed in India are accustomed to include fish in their daily diet. There are some 2,900 miles of coast-line of India, where the 100 fathom line extends to considerable distance from the coast which provides a vast area for fishing nearly equal to 1,15,000 square miles. The great perennial rivers of India and the innumerable tanks and reservoirs in the east and the south of the country also afford further additions to fishing grounds. These though exploited from time immemorial, lack scientific utilisation and development.

In case of coastal, and still more, as regards deep-sea fishing, the occupation is largely of a primitive character, carried on by ignorant, unorganised and ill equipped fishermen. Their technique is rudimentary, their tackle elementary and their capital equipment slight and inefficient. The possibility of the existing enterprise being turned into factory-scale production of edible or commercial fish, remains still to be tried. Several State Governments, like Madras and Bombay, have, it is true, made experiments in recent years to build up this industry on a modern scale; but the experiments still remain unconverted into commercial propositions. In these days of extreme food shortage, the neglect of this abundant and unfailing source of food supply of the country is unpardonable.

Indian rivers, lakes, ponds and coastal waters are immensely rich in all varieties of edible, as well as commercially valuable fish, that is those whose oil or other products have a commercial value. Fish is a perishable article. But even apart from modern methods of fish preservation and cold storage etc., traditional methods in India have been in vogue to salt, smoke and dry the fish, so as to be available for use sometime after the catch.

Industrially exploitable fish like cod and sardines need to be caught on a large scale by modern mechanical equipment, before a suitable industry can be developed in these directions. The deep sea around India has larger fish like sharks and whales; but this country with its rather primitive fishing enterprise has not

entered in whaling or fishing of larger types for industrial purposes, e.g. skin, bone, guts etc., of such fish. Large scale enterprise under Government or subsidy is necessary to develop these on a proper scale as part of a National Plan.



Map 40

The use of fish manure in orchards and gardens for the enrichment of certain varieties of fruit, though practised, need also be systematically expanded.

Commercially very valuable fishing consists, besides those already mentioned, of pearl fishing. The water of the straits dividing India from Ceylon, including the Gulf of Manar and the Arabian Sea near the edge of the Kathiawar Peninsula, as well as the Gulf of Cutch are rich in oyster beds, yielding highly valuable pearls. This has been exploited from very ancient times. The cultivation of oyster beds on a scientific basis: the preservation of these beds from indiscriminate and predatory enterprise; the careful breeding of oysters are all matters which are but slowly receiving the attention, that is their due, from the Government.

Pisciculture of ordinary edible fish, as well as those commercially valuable for their yield, needs intensive attention and scientific treatment from the authorities. Trout and salmon are being cultivated and specially bred in Kashmir, (Harwan and Achibal pisciculture centres) the Nilgiris and other suitable spots.

These however are more for sport than as a commercial proposition. Such attempts as have been made in this direction must be co-ordinated and integrated into a common national enterprise.

Mention must also be made of Chank (Shankha) fisheries of the Gulf of Manar. The chanks are either used as conch shells, or for making bangles. Large quantities are imported by W. Bengal.

To Madras must go the credit of establishing nearly 650 factories along its coast for producing fish manure and fish oil, and for the discovery of fish liver oils of high vitamin potency, which led to the commercial exploitation of the so called "shark liver oil". A factory for this product has also been established at Junput on the Contai coast in W. Bengal. Bombay and Travancore-Cochin also have shark liver oil factories.

The greatest potential source of fish is the 150,000 square miles of continental shelf around India, with a depth up to 100 fathoms. Of this area hardly 15,000 sq. miles are exploited at present, which yield approximately 400,000 tons of fish annually according to Dr. C. C. John. Thus a potential resource of 3,600,000 tons is yet untapped.

W. Bengal is a big producer as well as consumer of fresh water and esturian fish. Her production is given below in lakh maunds:—

	1937-38	1949-50
Sea fish	17.29	57.72
Fresh-water fish	31.33	11.97

The quantity of sea fish catch has risen considerably, but that of fresh-water fish has fallen. The entire population in this area eats fresh water and esturian fish. Innumerable perennial ponds, large tanks called *dighis,* marshy *bils.* cut offs, ox-bow lakes, rivers, water in paddy fields and the net work of salt water creeks in the Sunderbans provide ample opportunity for fresh and esturian fisheries development. An indigenous form of fish culture already exists. This has only to be developed further on scientific lines. The two famous esturian types are the shoals of Hilsa which swim up the rivers and reach far inland for spawning during the rainy season, and the Bhetki, which grows to a very large size in esturian waters. Lobsters and crabs also provide a rich harvest. Only feeble attempts have yet been made to develop this ideal ground for fresh water and esturian fisheries.

About 513,760 tons of fish are now caught in India annually of which 65% are sea fish.* This means that the average per head consumption by the fish-eating population is only 3.4 lbs a year, against a required minimum of 34 lbs.

Government of India now proposes to spend Rs. 189 lakhs to establish 5 pilot fishing stations at Bombay, Diamond Harbour, Chandbali (Orissa), Vizagapatam and Cochin. Fishing vessels attached to these stations will do exploratory work and catch about 500 to 600 tons of fish each annually. This may bring a revenue of Rs. 94 lakhs annually. They will be equipped with cold storage plants. A cannery for prawns will be established in Cochin. In Bombay an ex-naval vessel was converted into a fish trawler, and started exploratory work. But it proved expensive to operate. In 1949 two cutter-trawlers were purchased from Netherlands and two Reekie boats from U. K. They are doing useful exploratory work in Bombay in locating fishing grounds and finding types of fish available. They also caught 5,500 maunds of fish. A fishery personnel training school has been started in Bombay. Men after training here, are now employed as petty officers in the trawlers. A Fishery research station has also begun working in Mandapam, Madras. Offshore fishing has continued in Madras now for a number of years. But the trawlers are old and expensive to work.

West Bengal invited some Danish fishing experts recently, according to whose advice, proposals have been made to buy one 90 ton and another 70 ton cutter and fishing tackle. They will be used for fishing along the sea coast of W. Bengal and Orissa. To develop inland fisheries, a sum of over one crore of rupees will be spent on 50 schemes, which have yielded 2 lakh maunds of fish in 1949-50, and are expected to yield 20 lakh maunds in 1951-52. The schemes envisage (a) distribution of carp fry, (b) Fish curing facilities, (c) marketing and transport of fish, (d) conversion of fish waste to manure, and (e) Co-operative Societies to help fishermen.

A inland fishery research station has been, started at Palta near Calcutta. New fish curing yards have been opened at Bombay and Cochin.

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*Ministry of Information and Broadcasting news bulletin, 15th August, 1950.

CHAPTER XII

INDUSTRIES

Before the industrial revolution of the machine age, India ranked high among the industrial nations of the world. In textiles her muslins, silks and chintzes were in demand all over the world. In metallurgy Indian steel was used to make Damascus blades. The Iron Pillar of Delhi indicates her high degree of skill. Wooden ships built in India were purchased by Europeans. But after 1750, the discovery of mineral coal and the invention of the steam engine completely changed the economy of industrial production. The initiative soon passed to Europe and then to North America, followed by Japan. India was then under foreign domination and her British masters wanted her to supply raw materials to them and to buy manufactured goods from them. So modern industry using steam power by the use of mineral coal, developed very slowly indeed. It had also to fight against and is still fighting highly organised and well established industries in other parts of the world.

Modern industry had its begining in India in 1850. Coal was first mined in Raniganj in 1854. The tea industry began in 1852. The first cotton mill was started in Bombay in 1853, and the first jute mill began working in Calcutta in 1854. Tea and jute since then have always found a ready market nearly all over the world. Cotton textile industry has developed greatly, but it has changed in character, being a great supplier of yarn to China in the first stage, and later meeting the local needs.

Indian industry has developed under many severe drawbacks. Her *capital* has always been shy and enterprise and initiative lacking in her people. Her *labour,* though cheap is inefficient and migratory. Semi-skilled and skilled labour is not yet available easily. *Power* supply has also been inadequate. Little potential water power has been developed. A meagre 30 million tons of coal produced annually is hardly sufficient to put India on the same footing as the European nations. Yet another serious

handicap of Indian industry is, that she had to depend totally on foreigners for supplying *machinery*. She has yet to develop her own machine tool industry. For complicated electrical machinery she has still to depend largely on outside supply. Her *transport* system is not so well developed as to cope with her growing industries. Transport bottlenecks still cause delay.

Development of Industry was spasmodic, and generally in foreign hands in the early stages. The two most developed industries, jute and tea were British managed. *The First World War* gave an impetus to the development of Iron and Steel and some chemical industries. As foreign sources of supply of goods dried up, some of them had to be produced in the country. *Swadeshi movement* helped the cotton textile industry to a great extent and many other smaller ones to some extent *Protection* granted to some industries after the 1932 trade depression helped them to grow up, sugar being one of them. The *Second World War* again revived Indian industries in general.

The cumulative effect of all the above factors has been that a major part of our needs of cotton textiles, sugar and matches is being met by our own industries. Cement, paper and steel are still imported. Many new industries have grown up such as the automobile and ship-building industries; others are in the making, such as the rayon industry.

It is but natural that the national Government is trying hard to build up new industries and expand the existing ones. "Produce or perish" is the slogan of our leaders. The *sellers' market* is still there, though five years have elapsed since the war ended. *Exchange* difficulties, specially of dollars persist, though less than last year. Yet it seems unfortunate that the current production in many industries is below the installed capacity today.

The policy of the Indian Government to expand industry is to increase our national wealth, provide a stable and high level of employment and to prepare for defence. There has not been any clear cut policy on *nationalization of industries*. The extent of state interference in various industries is still uncertain.

As there is not sufficient capital in the country, the policy of the Government has been to invite *foreign capital*, to which assurances have been given of fair treatment and non-descrimina-

tion. This policy had some positive results, and more foreign capital is entering the country.

The level of *direct taxation* is still very high. The present system is practically the shadow of war profits projected into post-war times, and it does not give sufficient incentive for capital formation and industrial development.

There were fewer *labour troubles* in 1949 than the previous year. There were no major strikes or dislocations.

On the production side, though there has been a slight increase in every department except cotton and jute goods, much remains to be done still. The targets fixed for 1950 are definitely not high, and are either equal to or even less than the installed capacity. The following is the industrial position:—

	Installed Capacity	*Production 1948-49*	*Target for 1950*
Steel (m tons)	1.26	.85	1.0
Cloth (m yards)	2 lakh looms	4,338	4,500
Sugar (m tons)	1.4	1.0	1.2
Paper (1,000 tons)	110	98	110
Glass (1,000 tons)	150	70	100
Power alcohol (m gal)	10	8.4	10
Sulphuric acid (1,000 tons)	150	80	100

Production increased in the first half of the year 1950, as compared to the corresponding period in 1949. Only cotton textiles registered a fall. The following table compares the production in the two periods:—

	Jan.-June 1949	*Jan.-June 1950*
Steel (m tons)	.44	.46
Cloth (m yards)	1997	1910
Yarn (m lbs)	703	605
Paper (1,000 tons)	51	53
Cement (m tons)	.96	1.27
Sulphuric acid (1,000 tons)	40	50

The Planning Commission is drawing up a five years plan of development which will work in two stages. The first stage of

two years' will begin in 1951 and the second of three years in 1953. Efforts are being made to find out the causes of the gap between installed capacity and actual production.

Various industries are discussed in greater detail in what follows.

Cotton Textile Industry

This is the leading industry of India. Though it is concentrated in the Bombay State and specially in the towns of Bombay and Ahmedabad, it is more or less distributed all over India. Each major province has more than 10 mills, except Bihar which has 2, and Orissa which has none. The total number of mills in India is 395.

Under the Census of Manufacturers of 1946 the cotton textile industry was estimated to have produced Rs. 97 crores worth of goods, which was 46% of the value of the total industrial production. The industry also employed nearly 500,000 hands.

Development of cotton textile industry. Indian fabrics were in demand all over the world for their excellence from the times of the Roman Empire. Later during the Mogul period Dacca muslin became world famous. As far back as 1802 nearly 15,000 bales of cotton piecegoods were exported to England. The first textile mill was, however, openend near Calcutta in 1822, though a real begining was made in 1854, when a mill was erected in Bombay. In 1900 India had 5 million spindles and 40,000 looms. Today she has 10 million spindles and 200,000 looms. So in 1900 there were 125 spindles for each loom, while today there are only 50 spindles per loom. This was because India exported yarn to China and Japan. But this market was lost by 1910, and all the yarn had to be consumed at home. So the number of looms increased rapidly. India exported 250 m lbs of yarn in 1900, but after 1920 it fell to 80 m lbs. In 1938-39 it was 38 m lbs. Production of cloth rose from 500 m yards in 1900 to 1,160 m yards in 1914, and 1,650 m yards in 1918 (due to the war, when foreign import nearly ceased). War-time prosperity continued in the post-war period. The number of spindles and looms increased together with the production of yarn and cloth. In 1929-30 the mills produced 2,420 m yards. Protection was given to the industry after the 1932 depression, when there were 9.5 m

spindles and 186,000 looms. In 1938 the number rose to 10 m and 200,000. It has remained at this level since then.

Location: Besides Bombay and Ahmedabad, other important centres of the industry are Sholapur, Nagpur, Coimbatore, Madras, Trichinopoly, Madura, Bangalore, Ludhiana, Delhi, Kanpur, Calcutta and Murshidabad.

In the distribution of mills by States Bombay leads with over 200 mills, Madras comes next with 55, Bengal and U. P. have 40 and 25, E. Punjab and Madhya Pradesh about 10 each, Delhi 5, Ajmer 3, and Bihar 2, Other States have 65 more mills.

The local concentration of industry in *Bombay* is due to

(a) Nearness of raw material; this area being the main producer of cotton and thus having developed a hand loom industry even before power mills were set up.

(b) Availability of capital, due to the enterprising people of this area, who are well known for their business acumen.

(c) A humid climate which favours the making of yarns. In a dry climate yarns snap too often and make spinning difficult.

(d) Nearness of Bombay to Europe from where textile machinery was imported.

(e) Development of hydro-electric power in the Ghats which solved the problem of power supply to Bombay city.

Southern part of the State of *Madras* is second cotton textile producer of India. Here the chief advantages are the supply of cheap hydro-electric power from Pykara, Mettur and Papanasam. Medium and long staple cotton is also grown here. Coimbatore with its 31 mills is called the Manchester of the south. Other mills are in Madura, Salem and Tinnevelly.

Uttar Pradesh is the third largest cotton manufacturing State. Here the local market and good transport facilities are the only two advantages. Kanpur has 17 mills.

Madhya Pradesh is the next cotton textile centre. It is situated in the cotton growing area of India. Mills are scattered from Nagpur to Akola. They meet local neads.

The number of mills in *W. Bengal* has steadily increased in recent years, and now there are more than 40 mills. The port of Calcutta receiving cotton textile machinery from abroad, and importing long staple cotton helps the industry greatly. Coal from

the Damodar Valley supplies power. Local tastes are easily satisfied by these local mills.

Mill Production in recent years is given below:—

Year	*Yarn in m. lbs.*	*Cloth in m. yards*
1946	1,367	3,909
1947	1,296	3,762
1948	1,448	4,319
1949	1,360	3,906
1950 (Jan-June)	605	1,910

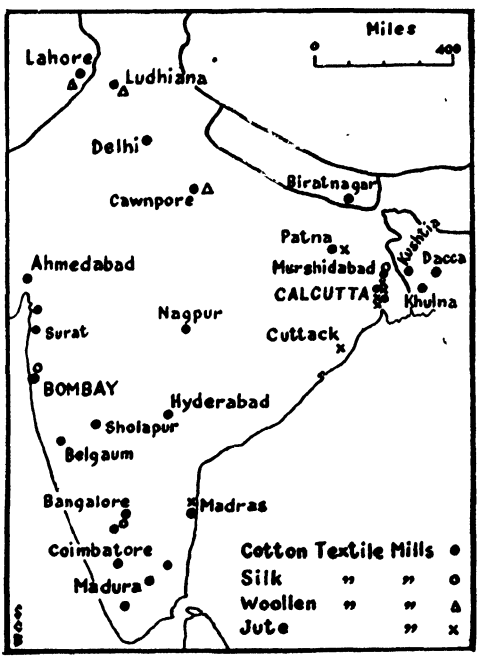
Partition of India has cut off the supply of long and medium staple cotton from W. Punjab. Out of a total production of one million bales of long staple cotton in Pakistan about 8 lakh bales used to be consumed by the Indian mills.

On the other hand Pakistan has only 15 mills, compared to India's 395. Pakistan has 3 lakhs spindles, while India has 100 lakhs. Pakistan has 30,000 looms, while India has 2 lakhs. The production of cloth in Pakistan is 425 million yards, while her needs are about 950 million yards. Total production of cloth in India is 6,045 million yards (these figures include handloom cloth). Considering the per capita consumption of cloth in India as 15 yards, she will have an exportable surplus of 1,500 million yards. This clearly brings out that in present conditions it will be beneficial for both the countries to exchange cloth and cotton. Agreements were reached on this issue between them a number of times, but could not be carried out very often. In 1948-49 Pakistan agreed to buy 300,000 bales of cloth and 100,000 bales of yarn from India. But she actually purchased 19,000 bales of cloth and 24,000 bales of yarn. Trade came to a standstill after the devalution of the Indian rupee. In the temporary Indo-Pakistan trade agreement signed in April, 1950, Pakistan agreed to buy 45,000 bales of cloth and 5,000 bales of yarn.

During World War II the mills had to switch over to production of material needed for war, and surplus stocks of cloth for civilian use gradually disappeared. With rising prices cloth control was introduced. The year 1947 started with an accumulated deficit

of 1,000 million yards. Reasons for shortage of cloth in 1947 may be taken to be as follows:--

(a) The control of prices was not considered to be remunerative by the mill owners, and so there was a fall of production. Rationalisation of prices was advocated, which meant that the prices of coarse and fine cloth should be so adjusted as to induce maximum production. Ultimately control was removed in 1948, but it had no salutary effect, and prices rose very high. The cloth traders made enormous profits and the Government was forced to impose partial control.



Map 41
Textile and Jute Industries

(b) Labour troubles continued. There were 106 strikes in Bombay cotton mills alone in 1946, leading to a loss of 93 million yards of cloth.

(c) No agreement was reached on three shifts, to which the Bombay Government did not agree, as it was thought that it will not be conducive to the well being of the labourers.

(d) The trade never played fairly with the customer. Black market in cloth continued throughout, in some form or other. Its worst phase was bulk smuggling of cloth across the Pakistan border, cloth fetching more price in Pakistan.

(e) Wear and tear of textile machinery during the war, and difficulty in its quick replacement.

(f) Rationalisation of production was urged, so that it may be concentrated on types and varieties required in greater quantity.

Production reached a peak of 4,319 m. yards of cloth in 1948, and conditions gradually changed in 1949, when demand (home consumption and export) fell below supply. Stocks of yarn and cloth began accumulating in the mill godowns, forcing them to close down one by one. The decline in production commenced from the reimposition of controls by the Govt. of India in July 1948. Control of distribution did not work properly and was a partial failure. Control of production also did not succeed in enforcing standards of quality and had to be relaxed towards the end of the year. Another main reason of the accumulation of stocks was the stoppage of export to Pakistan, following devaluation. Exports to other countries increased in 1950, giving some relief. The export quota for 1949-50 was fixed at 800 m. yards against the total export of 400 m. yards in 1948-49.

Another serious menace to cotton textile industry in 1949 was the difficulty in procuring long staple cotton. Raw cotton import from Pakistan which was 3 lakh bales in 1948-49, stopped next year. Indian mills require nearly 42 lakh bales of cotton. India produced 21 lakh bales of cotton in 1947-48 and 17 lakh bales in 1948-49. The crop in 1949-50 was expected to be 26 lakh bales. The balance could be met only by imports from Egypt, E. Africa, Brazil and U. S. A. Due to the above causes 15 mills closed down in Bombay State by the end of 1949 and 21 mills were partially closed. Reduced production and larger exports may again create shortage in cloth supply in the home market in 1950. Arrangements to import 11.7 lakh bales of cotton from outside, including U. S. A., had been made in the first half of 1950.

An industry allied to the textile industry is the *hosiery industry*. It is found scattered all over India. Hosiery mills are

very often small units, sometimes small enough to be called cottage industry. They are found in and around cities. Calcutta, Bombay, Kanpur, Ludhiana and Dellhi produce hosiery goods.

Silk Textile Industry

Silk industry came to India from China very early in the history of textile production, even before cotton came to be known. To improve the yield and quality of cocoons, worms were imported from China in 1770. French and Italian methods of reeling were also introduced. The East India Company began trade in raw silk reeled in their factories from cocoons purchased from local rearers from 1775. England became a regular customer of Bengal silk since then, and exports to her rose from half million to nearly a million lbs. in 1832, when a decline set in, due to the rise of silk industry in Europe. By 1875 Japan captured the raw silk market of the world and production of silk in Bengal fell. There are, however, 5,700 silk weavers in *W. Bengal* to-day. *Sonamukhi* in Bankura and *Islampur* in Murshidabad excel in making silk shirtings, whereas *Bishnupur* in Bankura, *Mirzapur* in Murshidabad, *Anandapur* in Midnapore and *Dainhat* in Burdwan specialize in dhoties and saris. Weavers buy raw silk from Malda and Murshidabad, but also use much foreign silk imported from Japan, China and Italy. Bengal silk has more glaze and durability than foreign silk. At present the W. Bengal Government is trying to develop the silk industry by organising rearing of the right type of cocoons and reeling on a co-operative basis. Marketing of raw silk is also being improved. West Bengal now reels about one million lbs. of silk. Besides handlooms she also has one of the three modern silk mills at Murshidabad. The other two are in Bombay and Bangalore.

Mysore comes next as a producer of silk, reeling about .75 million lbs every year. Besides supplying silk to handlooms spread all over South India, she runs the silk mills at Bangalore. During World War II, the Mysore silk industry was mobilized for producing parachute silk, and production rose very high.

The third leading State in India in the production of silk is *Kashmir*. *Kashmir* silk is well known for its lustre and beauty and is used as a base for the famous Kashmir needle work, all done by hand. A standard quality of silk called Taby silk is

produced in large quantities in the looms of the silk factory in Srinagar. Total production is about .25 million lbs.

Besides the three States mentioned above Madras reels 90,000 lbs, Assam 7,000 lbs and Punjab 1,000 lbs of silk.

Ludhiana, Amritsar and Jullundur have silk looms, and Ludhiana silk is sold all over India. But in quality the weavers of silk in Banaras are unsurpassed.

Though India produces a good amount of raw silk, sericulture has yet to be established in a proper and scientific manner. The sericulture institute at Ranchi is doing useful work in this line.

Rayon Industry

Rayon or artificial silk produced from wood-pulp is a serious competitor of natural silk. Rayon is cheap and bright coloured, and so is specially suited for the Indian market. The import of rayon was continuously rising before the world war, and according to one estimate, the consumption was about 70 tons per day. The demand should be much more now. The Government of India intended to issue licenses to the value of Rs. 85 lakhs for the import of rayon yarn from Japan, during the first half of 1950. Japan is steadily stepping up her production of rayon which had fallen during the war. Import of rayon yarn is given below:—

1938-39	.... 17.25 m. lbs.	1947-48	.... 9.83 m. lbs.
1946-47	.... 8.12 m. lbs.	1948-49	.... 39.97 m. lbs.

According to the Dehradun Forest Research Institute, India can produce the raw material (wood-pulp) needed for the industry from her forests in Deccan as well as in North India. Besides wood-pulp, various grasses, bamboo-pulp and cotton waste could also be used for producing rayon, the latter giving a very high percentage of rayon. Chemicals needed for the industry are either present or can be easily produced in India. The most important chemicals needed are carbon disulphide, caustic soda and ammonium sulphate. Various sites have been suggested in Bombay, Mysore and Hyderabad to start rayon industry. Agreements have been made with American concerns to install the plants and offer technical advice in the beginning. This is necessary because patents for technical processes involved in the industry are held by Americans. A rayon factory has gone into-

production at Perumbavoor in the Travancore-Cochin State. Here the forests of Malabar will supply wood pulp and hydro-clectric power will be available.

A factory is also to be established at Kalyan in Bombay, producing 5.6 m. lbs. of rayon per year. Carbon bisulphide will also be produced here at the rate of 4 tons a day for use in the factory.

Woollen Industry

In a warm country like India there is not much need for wool. Indeed the people of the lower strata never use woollen cloth. Gandhiji himself proved that woollen cioth was not needed for an Indian climate. Yet much wool and woollen cloth is imported from outside, and hence the need for expanding our woollen goods production, and improvement in its quality, for it is the better quality goods which are imported. Woollen goods of very high quality are produced in Kashmir including tweeds (pattu) and high class Kashmir shawls. Woollen mill industry is developed in Kanpur and Ludhiana. But hand spinning and knitting is established in the Himalayas, from Darjeeling to Kashmir. Handlooms are scattered in many parts of India including Srinagar, Agra, Mirzapur, Bikaner and Bangalore. India produces about 54 m. lbs of raw wool and receives 6 m. lbs. from Tibet. The best quality wools are from Kashmir and Bikaner. 11 m. lbs. of this wool are used for making carpets. The mill and cottage industry consumes about 25 m. lbs. The surplus is exported. Yet India also imports a good amount of high quality wool for making serges and flannels in the mills, and for knitting. She exported 38 m. lbs. of wool in 1948 and 25 m. lbs in 1949. Manufacture of woollen goods per year in m. lbs is given below :—

1946	....	27	1948	....	23.6
1947	....	24	1949	....	20.3

A cottage industry producing felts from *camel hair* exists in Rajasthan. Coats and caps of camel hair felt are made in Pushkar, Ajmer.

Jute Industry

This is the second most important industry of India. According to the industrial census of 1946, jute industry gave

employment to 3.2 lakh people. Its total productive capital was Rs. 50 crores. Total value of its products was Rs. 88 crores, of which Rs. 36 crores was the net value added by manufacture.

Though some handloom products were made in Bengal before 1850, the present industry is entirely due to foreign enterprise. The first jute mill began working in Calcutta in 1854. Dundee was and has been the chief supplier of jute mill machinery to India since then, though Calcutta became a great competitor of Dundee from 1900 and exceeded it in 1908. During the first world war jute industry prosperred greatly by supplying sand-bags used in trench war-fare. The number of mills doubled. Jute industry cantinued to prosper in the post-war period and the number of mills increased from 76 in 1919 to 100 in 1930. In the latter year there were 1.2 m. spindles and 62,000 looms. In 1929 the mills consumed a peak of 6.6 m. bales. But trade depression followed and in 1933 only 4.4 m. bales were required by the mills. But prosperity returned after a few year as the second world war approached. But the jute industry had to face many troubles during this war. They were (a) The danger of Calcutta being over-run by the Japanese, and panicky conditions in which labourers twice left Calcutta in big numbers, once in the begining of Japanese advance on Burma, and next during the bombing of Calcutta.

(b) Shortage of labour, which was absorbed elsewhere, on more remmunerative war service, such as building of landing grounds etc.

(c) Occupation of many jute mill premises by the military.

(d) Shortage of coal supply, which had to be pooled and then distributed among the mills.

(e) Stoppage of export due to shipping difficulty.

Inspite of all these difficulties the jute mill industry carried on during war and made profits.

The jute mill industry is nearly completely localized on the banks of river Hooghly above and below Calcutta. 105 mills out of 114 are situated here. The causes of this localisation are:—

(a) The port of Calcutta is the chief port of export of the jute producing region of India. Though more jute is grown in E. Bengal there was no well developed port on that side. Chitta-

gong is going to be developed now and some jute mills are sure to be started there.

(b) Coalfields are situated only 130 miles west of Calcutta. They have supplied power to the mills with great ease.

(c) The industry was mainly developed by the industrialists of the United Kingdom and they preferred the Calcutta site. Later on Indian capitalists also built their factories in Calcutta area, which became a great jute centre.

(d) Labour of all types wanted for the Jute Industry was attracted to Calcutta. Local labour gained efficiency in the matter. Thus labour is easily available in Calcutta and is difficult to obtain in other centres.

(e) The first power-mill in India to spin Jute started work at Rishra near Serampore, 12 miles north of Calcutta in 1855, and the first weaving mill in Baranagore on the opposite bank in 1859. Calcutta has thus gained a great geographic inertia. It is now a great centre for the trade of raw and manufactured jute. There are adequate storing facilities and very good port facilities for the export trade.

Bihar and U. P. have 3 mills each, Madras has 2 and Madhya Pradesh I.

The following table gives recent jute statistics:—

Year	*No. of working looms in Jan.*	*No. of spindles working in Jan.*	*Average Daily No. of Hands employed*
1944	64,119	12,93,152	2,90,702
1945	55,729	11,11,429	2,77,289
1946	54,233	10,89,763	2,96,382

Production in thousand tons:—

1946	....	1,089	1948	....	1,091
1947	....	1,052	1949	....	946

World demand outstripped supply after the world war but the production was not encouraging the causes for which are given below:—

(a) The jute crop in 1946-47 was 70% of the previous year.

(b) Reduction of working hours from 54 to 48 per week from August, 1947.

(c) Decontrol of prices from October 1946, which encouraged export of raw jute, which was higher by 4 lakh bales in 1947 than the estimate.

(d) Compulsory reduction of acreage by the Bengal Government.

(e) Rising prices of foodstuffs inducing the farmers to grow food crops instead of jute.

(f) Precarious supplies of coal, mainly due to transport bottleneck, which was alarming in September and October in the aftermath of partition. But actually no closedown of mills was necessitated from this cause.

(g) Labour troubles continued. There were 67 strikes in 1946.

The year 1949 was even worse for the industry as is shown by the production figures. Supply of raw jute from Pakistan stopped after the trade deadlock following devaluation in September, 1949. Some jute started coming only after a temporary trade agreement between India and Pakistan signed on April, 25, 1950. Though devaluation gave a fillip to the export trade, in case of jute it could not help as raw jute was scarce. Meanwhile paper bags are being used increasingly in U. S. A. To save the jute market from being lost, jute production must be stepped up quickly. Pakistan can do it by erecting jute mills and India by growing more jute. Perhaps India has a better chance of winning this race and keep the world jute market for her, at any rate, in the near future. Finally, however, Pakistan is sure to erect mills, resulting in over production and fall in prices. India and Pakistan will then have to come to some sort of agreement.

In April 1949 the India Jute Mill Association decided to seal 12.5% of the looms to conserve high grade jute. But the raw jute stock position still remained delicate. So a week's stoppage of work each month was decided from July, 1949. The stocks were only 6.42 lakh bales in September, 1949 on the eve of devaluation. The jute supplied by Pakistan was very often moisture laden and this was a further disadvantage. Pakistan fixed the exchange ratio at 100 Pakistani rupees to 144 Indian rupees. The Indian mills refused to buy Pakistani jute at prices thus boosted up. Though this resulted in the price of jute falling to

as low a figure as Rs. 15 per maund, yet Pakistan did not allow her jute to be sold at this price to India. The acreage and production of jute fell in Pakistan due to all these causes from 54.8 lakh bales in 1948-49 to 33.3 lakh bales (estimated) in 1949-50. Meanwhile jute production rose in India, being 15.5 lakh bales in 1947-48, 21.5 lakh bales in 1948-49, and 29 lakh bales in 1949-50 (estimated). New areas in Malabar and Uttar Pradesh have been brought under jute cultivation, and 5.5 lakh bales of additional jute were produced in eastern India.

A three-man delegation visited U. S. A. to examine economic conditions affecting jute goods trade. The leader of the delegation, Mr. M. A. Low, was of opinion that jute hessian, or burlap as it was called in U. S. A., was loosing ground. 80% of imported burlap was used for making bags. But paper and cotton bags were being used increasingly.

South Rhodesia was producing bags from a local fibre called *Urena lobata.* Another substitute fibre, *kenaf* was being grown in Cuba.

Jute Trade: India exported 477 m. yards of gunny bags and 1652 m yards of gunny cloth in 1948-49. In the same year she exported 214,000 tons of raw jute.

Iron and Steel Industry

Partition of India had no effect on this industry, as it had on cotton and jute industries. All the iron and steel works are situated in India, and the raw material needed for them are also in India. Gross capital invested in the industry is Rs. 25 crores. It gives employment to 60,000 persons.

The art of making iron in India was known in 2,000 B. C. The famous iron pillar near Kutab Minar, Delhi is of solid wrought iron of an excellent type. The famous 'wootz' steel was perhaps manufactured before the Christian era, and was exported to the West to be worked on to 'Damascus' swords. The first production of pig iron on a modern scale was begun in 1875 at *Kulti* near *Asansol.* These works finally came to be known as the Bengal Iron Co. Ltd. In 1900 the production of pig iron was nearly 35,000 tons annually, which rose to 250,000 tons in 1935. The company specializes in the production of cast iron products, clay

for moulds being obtainable nearby. The smelting originally was based on the local supply of ironstone shale. But this deposit soon proved useless. The ore now comes from Singhbhum.

The Tata Iron & Steel Co. Ltd. was formed in 1907 and started production in 1911. It is the second biggest steel plant of Asia, being exceeded only by the Yawata works in Japan. The localization of the industry is based on raw materials on various sides and the port of Calcutta near by. The relative position of these sources of raw materials is given below:—

Iron ore fields of Mayurbhanj	....	45 miles south,
Jharia Coalfield	....	115 miles north,
Limestone and dolomite at Gangpur	....	110 miles W. S. W.,
Manganese at Gangpur	....	110 miles W. S. W.,
Port of Calcutta	....	154 miles east.

All these are connected together by B. N. Railway.

The manufacture of steel commenced in 1912, and reached to nearly 700,000 tons annually. During World War II the company passed through an acid test, and emerged successfully. With foreign supplies cut off, the demand for various types of steels for civil as well as military needs was met successfully. Below is given a list of some of the various kinds of steels produced:*

"Tiscrom" Steel. This was specially prepared for the construction of the Howrah Bridge, when supplies of foreign steel were cut off during the war. Thus the production of the first alloy *high-tensile structural steel* came into being, and the new bridge, which is fabricated almost entirely out of "Tiscrom" steel, will stand as proof of the skill and ingenuity of Indian metallurgists.

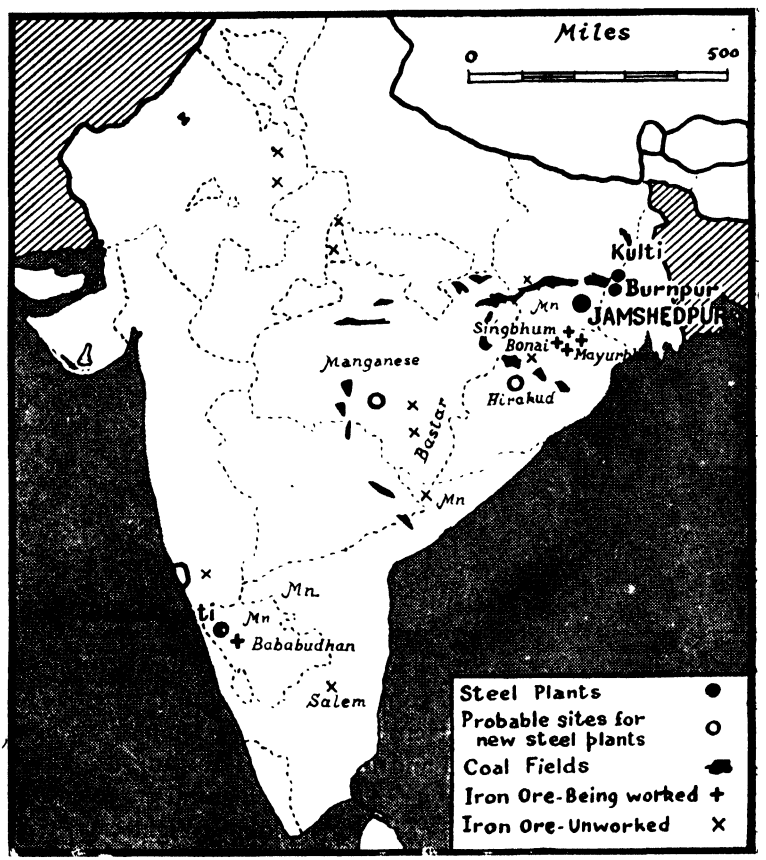
"Tiscor" Steel. This was made for structural purposes where welding is required. It is good for building freight cars, trolley buses, structural parts in ship-building etc.

Bullet-Proof Armour Plates for building armoured carriers for service in the Middle East.

Alloy for production of *armour piercing projectiles, non-magnetic bullet proof steel* for helmets and amphibious craft and *parachute harness.*

* P. H. Kutar, Presidential Adress, Engineering & Metallurgy, Indian Science Congress, Bangalore, 1946.

Steel for mint die, permanent magnet steel for telegraph and telephone, high-silicon steel for dynamos, high-speed tool steel and *stainless steel for surgical instruments* are some of the other steel types made by the Tatas as demand arose for them, foreign supply being cut off.



Map 42
Iron and Steel Industry

Tatas are now supplying steel for building ships in the ship-building yard at Vizagapatam.

The third centre for production of iron and steel started production at Burnpur in 1922 as the *Indian Iron & Steel Co. Ltd.*

which later came to be known as the Steel Corporation of Bengal. This place is a suburb of Asansol and is not far from Kulti works. The ore comes from Gua in Singhbhum. The machinery installed in this work is most modern.

The fourth centre for steel production in India is at *Bhadravati* in Mysore State. The ore is obtained from the *Kemmangundi* field in *Bababudan Hills,* 28 miles to the south. Limestone comes from *Bhandigudda* 14 miles to the east. As coal is not available, forest wood is supplied from the neighbouring forests as fuel. The work started production in 1923. The first electric steel furnace will be installed here soon. When the Jog Falls hydel plant, 85 miles to the W. N. W. starts working at full capacity of 120,000 kw, more electric power will be available for the plant, and it will gradually replace firewood.

The plan for the establishment of two Government steel mills is well advanced. Specialists were invited to investigate good sites for such plants. They visited some areas in M. P., Orissa, Madras and W. Bengal. According to their advice the Government has decided to erect two steel plants, each with a capacity of half million tons. One of them will be in Orissa and the other in Madhya Pradesh. The Orissa plant will be erected at Bonai Garh, Hirakud or Barakote. The Madhya Pradesh plant will be at Bilhai or Tandula. Iron ore, coal and limestone is found near these sites. They will also meet local needs. Thus the assembly of raw material as well as the dispersal of finished goods will be easier from these new sites. The cost of erecting the plants will be Rs. 90 crores.

Production statistics for India in thousand tons are given below:—

Year	*Pig-iron*	*Steel ingots*	*Finished steel*
1938-39	1,576	977	935
1942-43	1,804	1,299	1,253
1943-44	1,686	1,366	1,353
1944-45	1,300	1,254	1,268
1945-46	1,406	1,300	1,388

Production of steel ingots and castings in thousand tons for recent years is:—

1946	....	12,93	1948	....	12,56
1947	....	12,56	1949	....	13,53

The figures show that India produces just over one million tons of steel. For a big country like India, this figure is very low indeed. Her per capita production is one of the poorest.

Further there was a fall in production in 1947 and 1948. This was not due to non-availability of plant and machinery, for the productive capacity of the existing installations is greater than the production. The three main causes of the fall of production were:—

(a) *Labour trouble.* The strike in the Steel Corporation of Bengal was responsible for a loss of 100,000 tons of steel.

(b) *Coal shortage* continued throughout the year. The coal meant for Burnpur was diverted to Jamshedpur during the former's stoppage when the strike was on.

(c) *Transport* always created difficulties. Wagons were difficult to obtain, specially after the partition.

Conditions were better in 1949 in all the three respects. Yet production is still below the installed capacity. Tata and Scob have plans to expand there production by half million tons. The Government has granted loans to them to enable them to buy new machinery.

At present India has to depend upon steel import to meet her needs. She imported iron and steel manufactures worth 12 crores of rupees in 1948-49.

Other Metallurgical Industries

Mention has been made of these in Chapter X.

A Copper smelting plant and a yellow metal rolling mill are situated at *Maubhandar* near *Ghatsila.* Here the ore is crushed in ball-mills and the copper-bearing mineral is separated by flotation and then filtered and dried.

The successive stages in the smelting plant are (i) pulverized coal fired reverberatory furnace, (ii) Bessemer Converters and (iii) pulverized coal fired refinery furnaces, which produce copper ingots.

The copper is mixed with zinc in the ratio of two to one to produce yellow metal, which is converted into plates and sheets in the rolling mills. The output is nearly 800 tons of finished sheets per month. The Moubhandar works belong to the Indian Copper Corporation Ltd.

India has to meet her needs mainly by import. She imported 43,200 tons of copper in 1948-49.

The only other metallurgical industry in India is that of Aluminium production. It has only been recently started. At present two companies are working.

(i) *The Aluminium Company of India, Ltd.* This firm has its root in Canada. At present it is importing alumina from Canada and converting it to aluminium at its reduction plant at *Alwaye* in *Travancore.* Cheap hydro-electric power is available. The production is 100 tons of metal per month. The company is setting a plant at Muri near Jamshedpur for producing alumina from Indian bauxite from Lohardaga area. The factories at *Muri* and Alwaye aim at producing 5,000 tons of aluminium per year, the first stage of production of alumina from bauxite being done at Muri, and the second stage to produce aluminium from alumina being done at Alwaye. The third stage is reached in the firm's rolling mills at *Belur* near Calcutta. It is an up-to-date plant and is the only one in India which can produce aluminium sheets to R.I.A.F. specifications.

(ii) *The Aluminium Corporation of India, Ltd.* This company completes all the three stages in its works at *Anupnagar* near *Asansol.* At present thermal electric power is used. This is the first concern in India which is already producting finished goods from Indian bauxite ore. The production capacity is nearly 400 tons of metal per month.

Aluminium is gaining popularity in India. The annual imports rose from 2,500 tons in 1929 to 5,000 tons in 1939. The present demand is considerably higher.*

The establishment of an aluminium factory at Katni has been given up, as the bauxite deposits found near by are not up to the mark.

The aluminium industry is being subsidized by the Government at present. Production of aluminium in tons is given below:—

1946	....	3,236	1948	....	3,362
1947	....	3,215	1949	....	3,492

*G. C. Mitter, Recent researches on Non-ferrous metals and the position of the Non-ferrous metal industries in India.

Sugar Mill Industry

This is another leading industry of India which had comparatively a recent growth as compared to others mentioned before. 134 mills were working in 1949, of which 65 were in U. P., 29 in Bihar, 10 each in Madras and Bombay, one each in W. Bengal, Orissa and Punjab, and 17 in other states. There is thus a great localization of industry in the middle Gangetic valley in U. P. and Bihar, which may be called the sugar belt of India. The climate and soil of this belt is suitable for growing Indian type of cane, which is different from the Java cane. The industry has now acquired a greographic inertia, and is destined to stay.

The second sugar region is in south Deccan, where mills are found scattered in the southern districts of Madras State, Mysore and Hyderabad. Mention may be made of the Mysore Sugar Mill at Mandya which gets its supply from a state-owned plantation around it.

W. Bengal has only one sugar mill at Beldanga. Plans are ahead for erecting a sugar mill at Krishnagore, which will go into production in 1951. W. Bengal has asked the Central Government to permit the construction of two more sugar mills. The climate of W. Bengal is quite suitable for growing cane. W. Bengal is a deficit area in sugar. There is an overall shortage of sugar in India, and so the erection of more sugar mills in W. Bengal is most desirable.

Before World War I, India used to import beet-sugar from Germany and Austria to meet her small demand of mill sugar. After 1911 this supply was suddenly cut off and was replaced by the import of mill-made cane sugar from Java and Mauritius. The demand of this sugar gradually increased, as prejudice against it decreased. In 1932-33 protection was granted to the Indian sugar mill Industry and this had the magic effect of suddenly expanding it. While there were 32 mills in 1931-32, there were 112 mills in 1933-34. The production of mill sugar during this period rose from 159,000 tons to 454,000 tons. Yet this did not much affect the production of sugar refined from 'gur', and Khandsari sugar. But later on with greater development of mills the indigenous type of sugar production fell. The peak production of mill made sugar was in 1943-44 when 1,216,400 tons of

sugar were produced. The following table makes this comparision clear:—

	1931-32	*1933-34*	*1943-44*
No. of factories	32	112	145
Production of mill sugar	158,600	454,000	1,216,400
Do. of sugar refined from gur	62,000	64,900	7,700
Do. of Khandsari sugar	250,000	200,000	80,000
Total amount of sugar	470,600	718,900	1,304,100

Production statistics for mill made sugar in 1,000 tons is given below:—

Season	*No. of mills*	*Production*
1944-45	136	942
1945-46	138	923
1946-47	135	901
1947-48	134	1,075
1948-49	134	1,001

The figures show that the production has remained well below the 1943-44 peak. The causes are:—

(a) Cane crop diseases damaged the crop in U. P. and E. Punjab. The red rot disease accounted for much loss.

(b) Floods in Bihar and U. P.

(c) Labour disputes which caused a loss of about 40 lakh maunds of sugar in 1946-47.

(d) Transport difficulties and wagon shortage for carrying cane.

(e) Ineffective control over the price of gur which sold at high prices and thus diverted much cane for gur production.

The Central Government decontrolled sugar in December 1947. Sugar, after this, was readily available in the market. The retail price which shot up, gradually came down, though it remained definitely higher than the controlled price.

The price of Indian sugar is still very high, when compared to world market, though the industry was afforded protection from 1932 to 1949. This is mainly due to the different basis on which the Indian sugar industry stands, when compared to the other sugar producing countries of the world. While Indian mills have generally no plantations of cane attached to them,

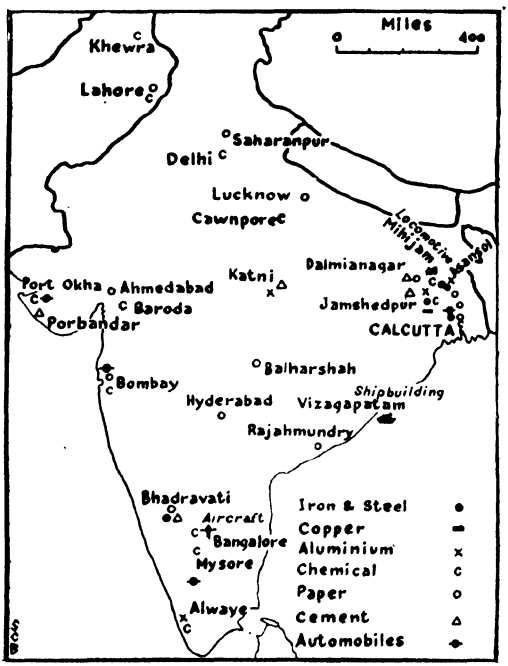
plantation culture is universally practised in Java, Mauritius, Cuba, Fiji and Hawaii. The cane produced in a plantation is of uniform quality, but that collected from surrounding villages is not so. The yield of cane is less than a quarter of the yield in other countries. Also the raw material for Indian mills is sometimes *gur*, whose bad and variable quality increases the price. Lack of communications and the slow bullock cart transport does not allow the cane to be collected from a large perimeter around the mill. The Indian mills are open for nearly three months in the year, and do not work for the remaining nine months. This raises the cost of production. Unless all these permanent drawbacks are removed, the cost of production will not fall much.

1949 has been a non-too-happy year for sugar industry. A sudden shortage of sugar appeared all over India in September 1949, and prices shot up. The causes of this shortage were (a) Production in 1948-49 was 73,900 tons less than 1947-48. (b) The price of cane was fixed at Rs. 1-10 per md. in Bihar and 1-13, per md. in U. P. in 1948 as against Rs. 2-0 per md. in the previous year. So farmers did not sell their cane to the mills, but crushed it themselves for making gur. (c) The price of mill sugar was lowered from Rs. 35-7 per md. to Rs. 28-8 per maund and so mills produced less sugar. The average crushing season was 98 days as against 144 days in the previous year (d) Sugar merchants anticipated a sugar shortage at the fag end of the season. So heavy buying of sugar and hoarding started. All sorts of other malpractices followed and by September sugar scarcity was intense all over India. Prices in the black market rose up to Rs. 4-0 per seer. Sugar rationing was reintroduced. People were forced to buy gur, and the new cane crop in December was diverted for gur production. (e) A good amount of sugar was smuggled in 1949 to Eastern and Western Pakistan.

Production of sugar in 1949-50 was 964,000 tons up to April, 1950 and was not expected to go above 980,000 tons. This is 20,900 tons less than the previous year. Apprehending a shortage in 1950 it has been decided to import sugar on a Government basis. Sugar control is of course to continue. Meanwhile the Government also announced the end of protection to the sugar industry for April 1950. It has to be seen how these decisions affect the industry in the crushing season in 1950-51.

Cement Industry

Like all other major industrues there was a slight set back in production in the cement industry in the post war years. Before war the production was definitely low, being 1.5 million tons in 1939. The war created a heavy demand for cement and the production rose to 2.3 million tons in 1941-42. However



Map 43
Metallurgical and other Industries

80 per cent of the production was requisitioned for military needs. Production in the succeeding years is given below:—

1942-43	2.18	Million tons
1943-44	2.11	do do
1944-45	2.05	do do
1945-46	2.08	do do

Production in recent years was even poorer as is shown by the following figures in m tons:—

1946-1.54	1948-1.55
1947-1.45	1949-2.10

Production went up to the level of war years only in 1949.

The fall in production was causd by wear and tear of plants from heavy work during the war, shortage of coal, transport bottleneck and labour trouble.

The installed capacity of plants is 2.4 million tons. Bihar leads in cement production. The two important producing centres are *Dalmianagar* and *Khelary*.

The former has the biggest cement plant of India. Its capacity will be doubled very soon. In Madhya Pradesh *Katni* is a big cement producing centre. *Porbandar* in Kathiawar is another important centre. Another centre is at *Bhadravati* in Mysore. In Madras the cement mills are at Dalmiapuram, Vijayawada, Madhukarai and Mangalagiri. Other cement mills are at Amritsar, Hyderabad and Gwalior.

New cement factories are being gradually opened in various parts of India. U. P. is to build a new factory. The installed capacity will thus go up to 3.1 m. tons. The distribution by States of cement production in 1949 was Bihar—700,000 tons; Madras—360,000 tons; Madhya Pradesh—350,000 tons; Punjab, PEPSU and Hyderabad—240,000 tons each; Rajasthan—225,000 tons; Saurashtra—222,000 tons.

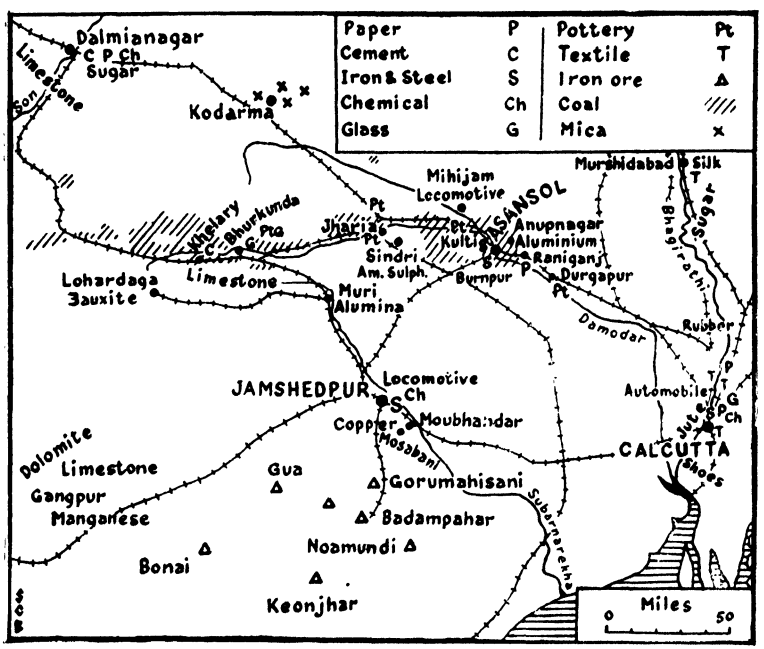
Government of India according to present plans intend to enlarge the cement industry to a capacity of 5 million tons yearly by 1952. The plan envisages a distributed production in all the States to lessen haulage.

Limestone, suitable aluminous clay and coal are the three chief requirements of the industry, and they occur widely in India.

Paper Industry

The first paper mill in India was established at *Bally* near Calcutta in 1870. But the progress of this industry never kept pace with consumption. In 1935-36 there were 17 paper mills in

India producing 48,100 tons, but imports were 141,800 tons. Thus home production met only one-third of the demand. The coming of the World War II somewhat changed this situation. The import of paper gradually stopped and home production rose. In 1942-43 it was 91,000 tons, and in 1944-45 it had just exceeded one lakh tons. W. Bengal the first producer of mill made paper, still leads in paper production with four mills. *Raniganj* has a big paper mills in addition to those in Calcutta area. U. P. has



Map 44

Established and proposed industrial units and mineral resources of southern parts of Bihar and W. Bengal.

mills including those at *Kanpur* and *Saharanpur*; Bombay has eight factories, and Bihar (Dalmianagar), Orissa (Brajrajnagar), Madras (Rajamundry), Mysore (Bhadravati), Travancore (Punalur), Hyderabad (Sirpur) and Punjab (Jagadhri) one each. In all there are 22 mills.

Production for some recent years is given below:—

1946—105,993 tons	1948— 97,905 tons
1947— 93,090 ,,	1949—103,194 ,,

Home production now meets nearly half the demands of consumption.

Sabai grass was first used as a raw material for paper. But the discovery of bamboo pulp as a raw material for paper manufacturing has made the problem of supply of raw material very easy. Bamboo grows extensively in India. It has also a very rapid growth, and new growth replaces the cutting very quickly.

A new giagantic paper mill is being planned to be built near *Balharshah* in Madhya Pradesh south of Nagpur. It will specialize in the production of news-print which is not produced as yet in India. Another news print mill is to be established at *Chandni* near Bombay. Sanction has been given by the Central Government to W. Bengal to establish a new paper mill. It has been contended that raw material supply for such a mill will be difficult, it would be better to locate the mill elsewhere. Even now some bamboo pulp needed by the industry in W. Bengal comes from E. Pakistan, and this is not easy to obtain.

There has been a steady increase in the consumption of news-print in India. The price of foreign imported paper has gone up. Hence there is a great need for manufacturing news-print in India. Recently paper made in Dehradun Forest Research Institute was successfully used in a rotary machine in a Delhi news paper. Besides Bombay and M. P., plans have been made to erect news-print mills in U. P.

Chemical Industry

A government census of production of various chemicals in the country made during World War II revealed the backwardness of chemical industry in India. Two panels appointed in 1945 determined the production, consumption and target to be achieved within a fixed number of years. Data with regard to important heavy chemicals in tons is given below:—

	Production	Consumption	5-year Target.
Sulphuric acid	59,000	55,760	152,600
Sulphur Compounds	18,400	26,300	54,000
Soda ash	74,000	107,500	270,000
Caustic Soda	12,600	54,000	133,000
Hydrochloric acid	2,500	—	—
Nitric acid	—	13,000	4,000

The panel on fine chemicals also made a list of the great needs of the country. It fixed a target of 2 million lbs. within 15 years for quinine, whose production was 100,000 lbs.

The importance of chemical industry is very great for the country in view of the fact that

(a) it is essential for defence,

(b) upon it depends the health of the nation,

(c) fertilizer industry is needed for improving agriculture, and

(d) chemical industry forms the basis of many other industries

It has been said that the amount of sulphuric acid produced in a country determines the total industrial development of that country.

The industry is specially concentrated around Calcutta, and in the states of Baroda and Mysore.

The industry got some impetus during World War I but the advantage gained was lost in the following years. During World War II a further and perhaps more lasting impetus was given to the industry. Unfortunately there has been very little progress during the last one two years.

As regards *artificial fertilizers, the production* of *ammonium sulphate* was 76,000 tons (Travancore 50,000 tons, Mysore 6,000 tons, coke ovens in Bihar 20,000 tons). The plant to be constructed at *Sindri* near Dhanbad, Bihar, which will produce 350,000 tons, has made good progress. It will be the biggest factory of its kind in Asia. Yet it will produce only one-sixth of nitrate fertilizers needed by India. The total cost of the plant will be Rs. 15 crores. The factory is on the bank of Damodar, about 15 miles from Dhanbad. Production is expected to start

by the end of 1950. An 80,000 kw. thermal-electric plant has been installed here to supply power. The chief raw material, coal is found nearby. Gypsum will have to be brought from Rajasthan for providing the sulphur needed for making ammonium sulphate. Supplies of water will be taken from the Damodar.

India needs nearly 700,000 tons of *super-phosphates* annually. Its production has been stepped up recently as the following figures show:—

1946—4,500 tons	1948—21,000 tons
1947—5,000 „	1949—47,000 „

Super-phosphates are badly needed to increase the yield of crops. Production of some chemicals in tons is given below:—

	1946	*1947*	*1948*	*1949*
Sulphuric acid	 60,000	60,000	80,000	80,000
Caustic soda	 2,900	3,314	4,383	6,303
Soda ash	 12,000	13,624	29,150	17,918
Bleaching powder	 2,000	2,550	2,840	2,470

Though the table shows an appreciable increase of the production of chemicals, the industry will have to be developed much more to meet all the internal needs. The case of caustic soda illustrates the issue. Nearly 50,000 tons of it is needed for our paper, soap and ceramic industries. Yet only 6,390 tons was produced in 1949.

A growing chemical industry is the plastic industry, which however still depends upon imported plastic bases. Calcutta is a great centre of plastic industry, where 40 firms are engaged in it. Over Rs. 50 lakh worth of plastic goods were produced in 1949. Some other new chemical industries include the establishment of a factory in Bombay to produce penicillin and sulpha drugs. The factory will cost about Rs. 3.5 crores and will start production in 1952.

The installation of a plant for producing synthetic dyestuffs and other synthetic drugs at some place in the Damodar Valley was also under consideration.

The government was also taking steps to set up a factory for producing Calcium carbide.

At present India spends about Rs. 10 crores every year to import chemical products.

The National Chemical Laboratory which was opened at Poona in January, 1950 will go a long way to help the chemical industry.

Glass Industry

Modern glass industry in India started in 1890 when a glass-bottle factory was established at Jhelum (W. Pakistan). Since then the industry very gradually developed and competed with foreign imports in some lines, such as glass bangles of Firozabad, U. P. competing with Japanese bangles. By 1939 the production in India had more than half the share of consumption.

During World War II there was a rapid increase from 80 establishments in 1939 to 174 in 1944. The number of workers rose in the same period from 9,000 to 18,000 and the production doubled and came to 20 million square feet of glass sheet, 14 million pieces of glass shells and 135,000 tons of other glass products.

The industry is mostly concentrated in U. P., Bombay, Bengal and Mysore. Besides various chemicals the industry mainly needs glass sands and coal. Nearness to coal is always favourable for it, whose continuous supply is essential. Sands are found at Naini and Banda in U. P. A big factory is to be erected at Bhurkunda in Bihar, where a supply of good quartz (to be powdered to sand) is available, while the site is in the Karanpura coalfield.

Production of glass sheet and ceramics in 1,000 tons is given below:—

	Glass Sheets	*Ceramics*
1947	 9,25	57,19
1948	 10,00	62,55
1949	 10,42	34,51

The establishment of the glass and ceramics research laboratory in Jadavpur, Calcutta in August, 1950, will help the industry greatly.

Power Alcohol Industry

With a very poor supply of mineral oil India should quickly develop this industry. The Government has set up an enquiry for this purpose. 400,000 tons of molasses are produced in India as a by-product of sugar industry. Only half of this amount is gainfully used.

15 distilleries in U. P. were producing 8 million gallons of rectified spirit from molasses. They could produce 50 million gallons of alcohol annually. This production could be easily doubled. Power alcohol mixed with petrol will meet the present demand of motor transport.

Production in million gallons is given below:—

	1947	*1948*	*1949*
Industrial alcohol	4.82	4.90	2.99
Power alcohol	2.26	3.54	4.01

The present government target for the annual production of power alcohol was 12 million gallons.

Ship-building Industry

In the times of wooden ships India had a position and prestige in the world as a ship-building nation. The wooden ships built at Bombay were used by the East India Company. But with the coming of steel ships, India lost her ship-building industry completely. The great necessity of India to establish a ship-building industry is evident from the following facts:—

(a) India possessed a merchant shipping of only 150,000 tons at the end of 1947, which had however increased to 3,50,000 tons in 1948. India's minimum needs at present are two million tons. The tonnage of U. K. is 18 million tons. India owns less than half per cent of world tonnage.

(b) India possesses a 3,600 mile long coast line, and her Peninsula bulges right into the centre of the Indian Ocean. Thus she has a commanding geographic position astride the eastern sea routes.

(c) India has a large international trade and her merchant navy is far too small to deal with it. During 1948 and 1949 she had to pay Rs. 30 crores as freight charges to foreign ships for

importing food grains alone. Even in her coastal trade she had a 62% share in 1949 (33% in 1939). It is a pity that even in her own coastal carrying from port to port, she has still to depend partly upon others.

(d) India has vast resources of iron ore, and though she has limited resources of good coal, much of her potential water power remains untapped. She could thus develop a steel industry worthy of her size, and fully supply steel to the ship-building industry. She has large forest resources to supply timber for ship-building for making cabins etc.

The first ship-building yards, able to build ships up to 10,000 tons displacement have been erected at Vizagapatam. Two slipways have been in use here, and six more could be made to allow eight ships to be built simultaneously. The first 8,000 tons ship *Jalausha* was launched in March 1948 by Pandit Jawahar Lal Nehru, and a second ship *Jalaprabha* was launched from the second slipway after a few months. Each slipway can build two ships per year. Two more 8,000 ton cargo ships Jalaprakash and Jalapankhi were launched in 1949. Two other ships of the same tonnage and design have also been built here. One of them, Jalapadma was launched in September, 1950, and the other a few months later. The ship-building yards have thus made a total tonnage of 48,000. The great advantage of Vizagapatam is the beautiful, natural, deep harbour, well protected from the Bay storms by the Dolphin's Nose promontary. There is no congestion, and ample space is available to develop ship-building. Rich iron ore deposits lie in the hinterland, which may well lead to the erection of new steel plants nearby. Meanwhile Vizagapatam will have to depend upon Jamshedpur, rather too far away. Also movement of big steel parts by railway will be costly. Timber is available in the forests nearby. Marine engines will have still to be imported from out-side, and all the ships built are fitted with foreign engines. Building of one or two ships at a time is also uneconomic.

In March, 1950 the Scindia Steam Navigation Company decided to suspend the construction of new ships. It was found that the 8,000 tons ships being built at Vizagapatam were costing Rs. 60 to 70 lakhs each, while the same ship could be bought from England at Rs. 35 to 40 lakhs. The reasons given for such

a disparity were high overhead charges, low productivity, absence of sufficient number of orders for construction and the begining of a new industry. At present a stop-gap arrangement has been made to keep the yards working, by the Government of India ordering two ships to be built, and agreeing to give the high price demanded. Some new permanent arrangement will have to be made, if the ship-building yard is to continue production. The capacity of the yard could be raised to eight slipways, so that the annual tonnage produced could be raised to 100,000 tons, at the rate of two 10,000 tons ships each year on each slipway. Meanwhile experts were invited by the Government to advise on erecting other ship-building yards at Calcutta, Bombay, Madras and Cochin. No final decision has yet been made in this respect. Near Calcutta sites at Rajganj, Uluberia and Geonkhali are being investigated.

Disadvantages of Calcutta for locating a ship-building yard are:—

(a) The bed of Hooghly is becoming shallower and difficult to navigate by continuous silting. Only 10,000 ton ships can enter Hooghly. So while Vizagapatam will be able to build bigger ships later on, Calcutta will not be able to do so.

(b) The high cost of land on the Hooghly, due to congestion.

Calcutta, however, is very near iron and coal and all kind of labour is available here.

Madras with an artificial harbour has little chance of developing as a ship-building centre. Some place on the West coast may be suitable. *Bhatkal* if developed as a new port will be very near Bhadravati steel works and Jog Falls electric plant in Mysore. It may later on develop as a good ship-building centre. There is ample space around Bombay to build ship-building yards. Only it is too far away from any known iron resources.

Air-Craft Industry

Geographical considerations make India very suitable for the development of both internal and world routes (see Chapter XIII). Aviation has expanded very quickly in the post-war period, and there is a great need for developing a suitable industry for making air-craft in India. There is only one concern of this kind now in India.

Early in the War, the Hindustan Aircraft Factory was founded as a joint venture of the Indian and Mysore Governments, which was managed by a private construction company. Its capacity, however, was very limited, being able to produce not more than 12 aircrafts a year. This was too small to meet the war demands, which ran into hundreds of various kinds of planes. The factory, however, was useful in providing an excellent workshop for carrying out repairs and replacements needed because of the war. The private partner in the venture was bought out in 1942, and the Hindustan Aircraft Corporation is now a joint venture of the Mysore and Indian Governments. It would need to be considerably expanded, if the factory is to serve its real purpose in providing repairs and replacements to aircraft and building new ones of all kinds for civil and military requirements. The factory at present is doing only overhaul, repair and assembly work. The Govt. of India has placed an order of 50 aircrafts (Percival Prentice Trainers) with the Company. The first 20 aircrafts will be made by assembly of parts obtained from Percival Co. of England. The first trainer aircraft assembled in the factory have already been successfully flown. Meanwhile in May, 1950 the board of directors of the company decided to take up immediately large scale assembly and later manufacture of modern and advanced types of military aircraft. Arrangements have been concluded with a foreign firm. Another very useful work the factory has been doing is the servicing of civil aircraft. The company has also taken over the civil aviation unit at Barrackpore near Calcutta. It will be used for serving civil aircraft passing through Calcutta, whose numbers have increased tremendously in recent years. The Bangalore factory is also producing railway coaches of up-to-date designs for the Indian railways.

The three advantages of Bangalore as the site for the factory are its salubrious climate, supply of cheap electric power from Sivasamudram, Shimsha and Jog Falls, and supply of high class steel from Bhadravati, the charcoal made steel being always of a high quality. Later Bhadravati will produce steel from electric furnace. The working and proposed aluminium plants at Alwaye, Anupnagar (near Asansol) and Muri are rather far away. The rolling mill of aluminium, which can produce aluminium sheets to air-craft specifications is at Belur (Calcutta). Wood which can

be used for aircraft has not yet been finally selected by the Dehradun Forest Institute, but the choice will most probably fall on Himalayan Fir (Abies pindrow).

Asansol area has perhaps greater advantages of starting a new aircraft industry. It has steel and aluminium plants and coal. Hydro-electric power will be produced as the Damodar Valley Project is completed. Supply of timber from Himalayan fir will be also nearer than in the case of Bangalore.

Automobile Industry

This new industry, like the other two mentioned above, is just having its beginnings. But assembly from imported parts is only being done up till now. The motor car engine manufacture will still take some time. The present needs of India are only 15,000 new cars and trucks, which is too small for supporting a full fledged industry. But perhaps demand will increase in near future, by civilians as roads and road transport develop and by military as the army is mechanized. At persent there is one vehicle for every 4 persons in U. S. A. and one for 2,000 persons in India.

It has been suggested that the automobile factories, to be economically profitable units should also manufacture textile machinery, agricultural machinery, cycles, boats, cutlery etc.

The chances of Bombay, Madras and Calcutta developing as automobile industry centres are bright. They have assembly plants working at present in their suburbs of Sewree ,Ennore and Uttarpara. Bombay has a ready supply of cheap hydro-electric power, abundant supply of water and equable climate. It is suggested that carbon steel billets and sheets be bought from the existing steel companies and re-rolled into finished sections in the automobile factories, which also may use hydro-electric power to make various types of alloy steels necessary. The manufacture of textile machinery as an adjunct will find a ready market in Bombay.

Calcutta has an additional advantage of its nearness to coal and the steel industry. These centres have a wide and well organised local market and great facilities for distribution in their hinterlands. At these places, trained labour having practical experience in precision work, is available.

A feature of the present automobile works in India is that they are working in co-operation with foreign firms. There are, however some serious disadvantages under which the present factories have to work. They are:—

(a) The market for automobiles in India is limited and the product has to compete with foreign competitors which command vast financial and technical resources and have been turning out automobile components by the million. There overhead charges are therefore less.

(b) The scarcity of foreign exchange has made it compulsory to use substitutes made in India as far as possible, though there prices sometimes are 200 to 300% more than imported articles. Also the import of those parts which can be supplied only by foreign countries has been strictly limited.

By far the biggest automobile factory now in India is the Hindusthan Motor Company at Uttarpara near Calcutta. It has a capacity of producing 8 cars and 8 trucks per hour. Working at 3 eight hour shifts per day, it can turn out 60, 000 vehicles per year. At present, however, the factory is producing 8 cars and 8 trucks per day, which comes to about 5,000 vehicles per year. The overhead charges, therefore, are very high. The causes of this limited production have already been mentioned. 80% of the mechanical components of the cars will be manufactured at the factory by the end of 1950, though many of the rough castings and stampings will still have to be imported. These could be made in India only when produced on a large scale. The other 20% components such as carburettors, electrical equipments and dashboard instruments are solely imported. Seats and upholstery are all made in Indian material. The large metal panels, called pressings, used for the body of the car are imported from abroad, no large enough presses being available in India for the job. Small panels, however, are being made at the factory.

Ashok Motors plant at Ennore, Madras has an installed capacity of 20 cars and 10 trucks per day. Their actual production at present is 8 cars and six trucks per day. Indigenous items such as tyres, batteries and trimmings are used as far as possible in the assembly of vehicles.

Peninsular Motors combined works at Sewree, Bombay and Calcutta have a capacity of assembling 8 cars and 20 chassis for one shift per day.

The Premier Automobiles factory at Kurla, Bombay has a capacity of assembling 35 vehicles per day. It also produces various components such as radiators, petrol tanks etc.

The French Motor Car Company has an assembly plant in Bombay with capacity of 2 cars and 2 trucks per day, but the rate of production is 10 a week for each.

Ford Motor Company has an assembly plant at Bombay with a full capacity of 100 vehicles per day, but the production in 1950 was 10 vehicles per day.

Addisons of Madras have a capacity of assembling 5 vehicles per day.

General, Motors India Ltd. specialize in producing passenger bus bodies. There plant at Sewree, Bombay is now turning out 4 'buses every day.

Locomotive Industry

This is the fourth important new industry to be established in India. The present shortage of locomotives has shown how seriously India needs to develop this industry.

In 1936-37 a proposal in the Legislative Assembly to establish a Locomotive Production Enterprise, was turned down by Government on spurious excuses and unconvincing arguments. A private concern formed soon after World War I, for the manufacture of locomotives and wagons and failed mainly because of the ruthless competition of foreign makers.

World War II however, emphasized the need of self-sufficiency in this respect, and so the Government had perforce to change their policy in 1943. So the first concern in the field was established. It was the Tata Engineering and Locomotive Company, a sister concern of the Tata organization at Jamshedpur. The Company has taken up the manufacture of locomotives and other heavy engineering machinery.

The Government of India have now decided to set up a big locomotive plant at *Chittaranjan,* near Asansol. Kanchrapara in W. Bengal was not considered suitable as it was too much near the border, and away from steel centres.

The Chittaranjan workshops are designed to build 120 locomotives and 50 spare boilers every year. Erection of the plant

has proceeded very satisfactory. The first stage of production started when one of the components, the Light Machine shop was opened by Srimati Basanti Devi, wife of Deshbandhu Chittaranjan Das, on 26th January, 1950.

Chittaranjan is at the western end of the district of Burdwan in W. Bengal on the main double track railway line from Calcutta, only 17 miles from Asansol junction, from where a line goes to Jamshedpur. It lies on the brink of the Raniganj coalfield and near the steel factories of Kulti and Burnpur. Lying between Ajay and Barakar, its water supply problem will be easy. A reservoir has been built on the top of a local hillock. But these arrangements were not completed in 1949, when a great water shortage was felt. Cheap labour is also available in the region. The establishment of the works will cost Rs. 14 crores. It will give employment to 10,000 people. The first locomotive will be produced at the end of 1951, while spare part production will begin earlier.

The Tata Locomotive Company (Telco) will produce, when completed, 100 locomotives and 100 spare boilers per year. The shop has already been turning out spare boilers. The first locomotive from these shops will move out early in 1952. This workshop will have the additional advantage of having the big Tata Steel works as her neighbour. Coal will be obtained from Jharia. Technicians of the Tata Company will be always available for her development. When Telco and Chittaranjan will begin working at full capacity India will not need to import locomotives from outside.

Cable and Telephone Industry

Near Chittaranjan a Government Factory will be erected to produce cables under the supervision of British Standard Telephone Cables Company. Planned for completion within two years, the factory is expected to manufacture annually Rs. 60 lakh worth of telephone cables, sufficient to meet all our needs. Government has also established a telephone factory, which started assembling 500 telephones per week in April, 1949. In due course, it is expected to produce spare parts, machinery for which purpose is being installed.

Electrical Industries

These industries, which are nearly all new-comers are producing electric lamps, fans, dry cells, batteries and insulated cables. They began by importing spares and semi-finished articles from abroad and assembling them. But during the war they were forced to use more Indian material. The advance in production is seen from the following figures:—

	Pre-war	*1948*	*1949*
Electric bulbs (mil)	2.25	9.25	11.36
Electric fans (Nos)	3,000	180,000	165,300
Dry cells (mil)	nil	124	151
Storage batteries (Nos)	nil	110,000	107,000
Transformers (KVA)	3,000	82,000	109,000
Insulated cables (m yards)	7	22	19
Radio sets (Nos)	nil	25,000	16,000

Machine Tool Industry

This industry is of basic importance in a programme of the industrial development of India. Machine tools are needed in every industry. The production of machine tools, however, low as it was, showed a decline in production, as the following figures show, giving the value of production in lakhs of rupees:—

1946	91	1948	55
1947	46	1949	47

The Government decided to open a machine tool factory producing precision type machine tools worth Rs. 8 crores per year. It was later on decided to set up the factory in Mysore. The factory will go a long way in meeting the needs of various industrial concerns in the country.

Bicycle Industry

This is a new and a rapidly growing industry, which will soon meet all the internal needs. Numbers of cycles produced every year is given below:—

1946	50,650	1948	64,740
1947	48,827	1949	94,066

At present there are two factories producing complete bicycles and two producing spare parts. The internal needs are estimated to be 300,000 bicycles per year. Three new bicycle companies are to be established, one near Calcutta and two near Madras, each with a capacity of producing 100,000 bicycles each year. They have entered into agreement with the well known British concerns, B. S. A., Raleigh and Hercules to collaborate with them. When they go into full production, India will become self-sufficient in bicycles.

Matches Industry

Execpt for a small factory in Ahmedabad opened in 1895, which is still working today, the modern match industry was fully established in 1924. In 1921 there were only two match factories in India employing 400 workers. In 1923 the Western India Match Company, under Swedish control established factories at Calcutta, Madras, Bareilly and Ambernath. This was to avoid import duty levied on matches in 1922. The Swedish concern is a powerful match producing company with branches in 40 countries in the world. Today it supplies 80% of Indian needs from her factories in India. In 1939 there were 113 factories employing 16,000 workers. Today there are 108 factories in Calcutta, Gwalior, Dhubri (Assam), Kotah (Madhya Bharat), Tiruvattiyur (Madras), Shimoga (Mysore), Baroda and Travancore. The most important raw material needed for match industry is suitable type of wood. Its supply comes from Andamans, but other Indian woods are being used increasingly.

The production of *cigarettes* is also on the increase. The Indian made cigarettes are yet of low quality and cannot compare with imported varieties. Great efforts are being made to produce the right type of tobacco for making good quality cigarettes. Good quality cigarette tobacco is now being grown in Godavari Delta. A very large proportion of smokers, however, use 'biris' or tobacco wrapped in leaves. There is much internal trade in biri leaves and tobacco. Production of matches and cigarettes is given below :—

	1947	*1948*	*1949*
Matches (cases of 50 gross boxes)	465,718	533,243	524,322
Cigarettes (Nos. in millions)	18,879	21,825	21,951

Leather Industry

Having the biggest cattle population in the world India is naturally a leading producer of hides. Her leather industry depends upon this enormous supply of raw material. Indian cows may be unhealthy, and they may produce a small amount of milk per head, but on death each cow gives a good hide. The great population of goats and sheep also supplies skins.

The Indian leather industry may be divided into two parts: (a) tanning and (b) foot-wear, saddlery and upholstery. About 60% of hides and 40% of skins are tanned in India. Besides indigenous tanning by 'chamars' using local vegetable tanning materials, there are large concerns in Calcutta, Kanpur, Agra, Delhi and Madras. Here tanning is done by myrobalans or babul bark. Mineral tanning is done by the use of chromium sulphate Production of tanned hides (buffaloes and cows) is given below:—

	1948	*1949*
Vegetable tanned (Nos.) ..	1,953,000	1,835,274
Chrome tanned (Nos.)	1,087,000	580,552

India is a leading exporter of raw and tanned hides and skins. Export of these commodities in lakhs of rupees are given below:—

1938-39	*1947-48*	*1948-49*
11,32	21,98	18,29

Production of shoes may be divided into western types and indigenous types. Import of foreign shoes has steadily gone down. The chief shoe making centres are Kanpur, Agra, Calcutta and Madras. The Bata works near Calcutta are now the biggest in India. During World War II, shoe, harness and saddlery production increased tremendously to supply the armies. Production of shoes is given below:—

	1948	*1949*
Western type foot wear (1,000 pairs)	3,202	2,850
Indigenous type foot wear (1,000 pairs)	2,068	2,109

Hurricane Lanterns

This is also a growing industry. Not long ago lanterns were imported from outside. With electric power, yet poorly developed, there is a big demand of lanterns in India. Numbers of lanterns produced annually is given below :—

1946	....	470,000	1948	....	778,599
1947	....	910,071	1949	....	1,728,036

Sewing Machines

Similar to lanters the production of sewing machines is also steadily increasing at a rapid rate, as is shown by the follow ing figures :—

1946	....	6,121	1948	....	20,019
1947	....	5,860	1949	....	25,029

CHAPTER—XIII

TRANSPORT AND TRADE CENTRES

Considering the vast size of India (1,220,466 sq. miles) and her dense population (319 millions), her transport system including roads, railways, waterways and airways is very poorly developed, specially when compared to leading European countries, the U. S. S. R. and the U. S. A. However, when compared to Asian countries, her position is quite satisfactory, for it is better than all other Asian countries excluding Japan and Java.

Road Transport

India possesses 240,000 miles of extra-municipal roads (1947) of these nearly 80,000 miles are surfaced. Others can be used only in dry weather, while the remainder are used only by bullock carts. 11,000 miles of the surfaced roads have been classified as National Highways and they are the responsibility of the Central Government. Between 1914 and 1946 the expenditure on roads increased from Rs. 4 crores to Rs. 14 crores. Yet much more development is needed.

The total number of motor vehicles has slowly increased from 144,000 in 1939 to 179,000 in 1948. So there is one motor vehicle for every 1800 persons. Compared to these figures the U. S. A., with an area of 2,977,000 sq. miles, which is somewhat more than double of India and a population 132 millions, which is less than half of India, has 1,430,000 miles of surfaced roadways, and one motor vehicle for every 4 persons.

With the rise in number of motor vehicles, the consumption of petrol has increased steadily as the following figures (m. gallons) show:—

1930	5	1947-48	109
1938	37	1948-49	119

Besides motor vehicles the roads are used by nearly nine million bullock carts, which carry nearly 100 m. tons of goods every year, and a large number of passengers. In large parts of India in the villages, bullock carts are the only means of communication. But they also use the surfaced roads. They carry the village produce from one place to another, and from field to factory. Caravans of bullock carts are seen carrying cotton to the ginning mills in Berar and Khandesh during winter. They carry cane to the sugar mills in U. P. Even in the Himalayan mountains, in Kashmir, Kumaon and Darjeeling bullock carts in large numbers toil up and down the winding roads.

The Indian road net, which is the best on the Asian mainland, is too thin when compared to the American or European road net.

Besides this main drawback there are further defects in our road system which are given below:—

(1) There are large gaps in the thin road net, in hilly regions involving circuitous routes from one point to another.

(2) The roads are narrow, and the bridges very narrow indeed, even on the Grand Trunk Road, between Calcutta and Delhi.

(3) Many rivers are unbridged. Arrangements for crossing are not available at all points. Where there are ferry arrangements, long lines of cars have often to wait for hours for their turn to cross over. Such breaks in the roads cause unavoidable harassment and delay.

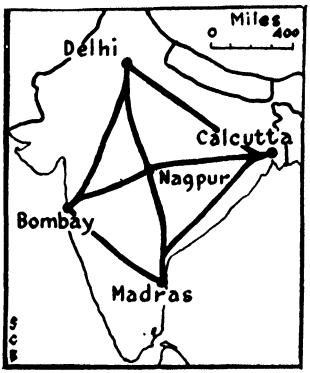
(4) Road surfaces are not always well kept; their condition has become deplorable in the post-war period.

(5) Roads in Eastern India consist of disjointed links from one point to another. There are few trunk roads to boast about. The big rivers have no road bridges.

A big 10 years Road Plan was mooted at Nagpur in 1943. It was to treble the roads of India. Many major bridges were to be built under this plan. Roads were to be divided into 4 classes:—

(a) *National Highways*: They were to be constructed and maintained by the Centre. They would be broad, straight high-

ways, completely provided with bridges connecting the main cities of India. The six main highways were to connect Calcutta with Delhi, Bombay and Madras, and in addition Delhi with Bombay and Madras, and again Bombay with Madras. Some major bridges would be built to carry these highways, such as those over the Katjuri and Koakhai between Calcutta and Madras, and over Barakar and Poonpoon between Calcutta and Delhi. The highways will avoid congested areas.



Map 45

Approximate allignment of six National Highways.

(b) *Provincial or State Highways*: They were to be constructed by the States, and would connect various towns in the States, and also provide connection with the National Highways passing through the area.

(c) *District roads*: They were to be constructed and maintained by District Boards.

(d) *Village roads*: These were to provide transport facilities to villages, and connect them with district roads or provincial highways.

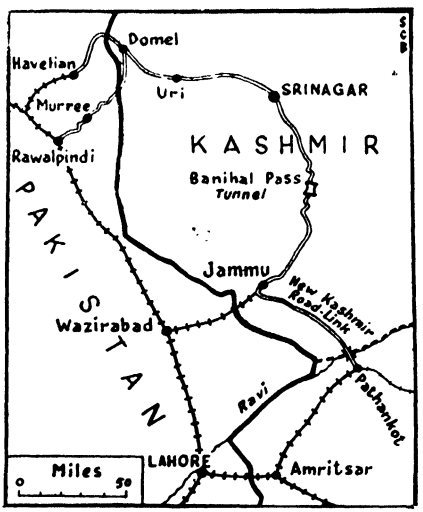
42 road engineers were sent to U. K. and U. S. A. to study modern highway engineering. But only engineers will not suffice to produce a good road plan.

The Nagpur Road Plan which envisaged the construction of 400,000 miles of roads had to be reduced for various causes. After partition the target was reduced to 311,000 miles. In 1946 Rs. 145 crores were earmarked for the development of roads in

five years. But the need of economy effected this scheme, and the expense was reduced to Rs. 100 crores in the five-year period. Three years have, however, elapsed since then and the progress has been very slow. The transport programme has been hit badly by the economy drive.

Effect of Partition on Communications between India and Kashmir

The two lines of communication with Srinagar are through W. Pakistan. The more important of the two is the road from Rawalpindi via Murree, Kohala (bridge over River Jhelum) and



Map 46
Effect of creation of W. Pakistan on communications between India & Kashmir.

Uri to Srinagar. From Rawalpindi to Kohala the road lies in Pakistan. It is open all the year round. The other communication line is the railway from Wazirabad in Pakistan to Jammu in Kashmir. From Jammu a road runs to Srinagar. It crosses over the Pir Panjal Range by the Banihal Pass nearly 9,000 feet high. It is snow bound for five months in the winter. Both the approaches to Srinagar being from Pakistan, it became necessary to build a new road to Kashmir from India. It has now been built

from Pathankot to Jammu. A new bridge was built over the Ravi at Madhopur. Pathankot is connected by a broad gauge railway line with Amritsar. To keep the Pathankot-Jammu-Banihal-Srinagar road open all the year round, snow clearing operations are carried out for five months. A new tunnel through Pir Panjal at a lower level can alone solve this problem. Incidentally it will reduce the road mileage. An air-route also operates between Delhi, Amritsar and Srinagar.

Railways

The first railway lines in India were laid nearly hundred years ago from Calcutta to Raniganj and from Bombay to Kalyan. Railways expanded rapidly from 1900. During World War I they made great profits. The volume of freight traffic carried by the railways increased three and a half times from 1900 to 1949. Today the railways are the most important means of transport. They carry nearly three-fourth of the total passenger and freight traffic.

Passenger miles and ton miles carried by the railways are given below:—

	1938-39	*1947-48*
Passenger miles (millions)	17,988	21,878
Ton miles (millions)	30,192	19,170

Similar to roads the railway net work in India is thin when compared to the U. S. A. and European countries, but in Asia its density is exceeded only by the railway nets in Japan and Java. With an area of 1,220,466 square miles, the route mileage of railways in India is 34,000 miles. Compared to it the U. S. A. with an area of 2,977,000 square miles has a railway route mileage of 257,500 miles. Thus the density of the railway net of India is hardly one-tenth of that of the U. S. A. With a bigger population India should have more railway lines than U. S. A.

The railways of India in addition to being few and far between, suffer from many other disabilities, which are given below:—

(a) The railways were constructed practically without any plan. They were mainly constructed for carrying trade with Britain, namely carrying raw materials from the hinterlands to

the ports and taking manufactured goods inland. So they converged on the ports. Direct inland routes from one point to another were not developed. There was no straight route from Peshawar to Madras, and the Grand Trunk Express which was inaugurated two decades ago had to use parts of the railway systems of N. W. R., G. I. P. R., N. S. R., and M. S. M. R. Naturally therefore, it was a circuitous route, and took a very long time to cover. The Express went further up to Mangalore by S. I. R. If one wanted to go from Gauhati to Banaras, there was no direct through train, and it was more convenient to go via the port of Calcutta.

(b) The railways were built by British capital, and for a very long time nearly all the share-holders were British. They were nationalized only recently. Some small railway lines are still managed by private concerns. A co-ordinated plan for running the railway systems of India could not be developed for a very long time. The national Government is now directing its energies to this end.

(c) The railways consist of three kinds of gauges. The majority of the lines on the main routes are on broad gauges, but large areas are served by metre gauges, such as those in Western Rajasthan, North Bihar, Assam and South India. In addition there are many small narrow gauge branch lines and extensions. Break of bulk is thus necessary when changing from one gauge to another. Unification of gauges is now practically an impossibility.

(d) In N. E. India there are very big rivers. The portion of Ganges lying in India, below Banaras is unbridged. Brahmaputra in Assam is also unbridged. There are costly and troublesome crossings by ferry steamers between railway terminals on the two river banks at many points. Plans for building a bridge across the Ganges in Bihar are well advanced. The possibily of building a bridge over Brahmaputra is also under consideration.

(e) Dense forests and hilly regions offer difficulties in running the railways in Central India, Western Ghats, Terai forests, Himalayas and the Assam Plateau.

Construction of some new lines has started now, of which *Assam-Link Railway* is the most important. During war the

railways passed through a great strain. Even coastal traffic had to be taken over by the railways, as the Bay of Bengal was dominated by the Japanese Navy. Vast amounts of war material and army personnel had also to be carried by the railways during war.

On the other hand locomotives and rolling stock could not be replaced, and shortage continues even now. Partition and communal trouble in the Punjab aggravated the trouble. Also a major proportion of engine drivers opted for Pakistan. The railways have yet to overcome these difficulties.

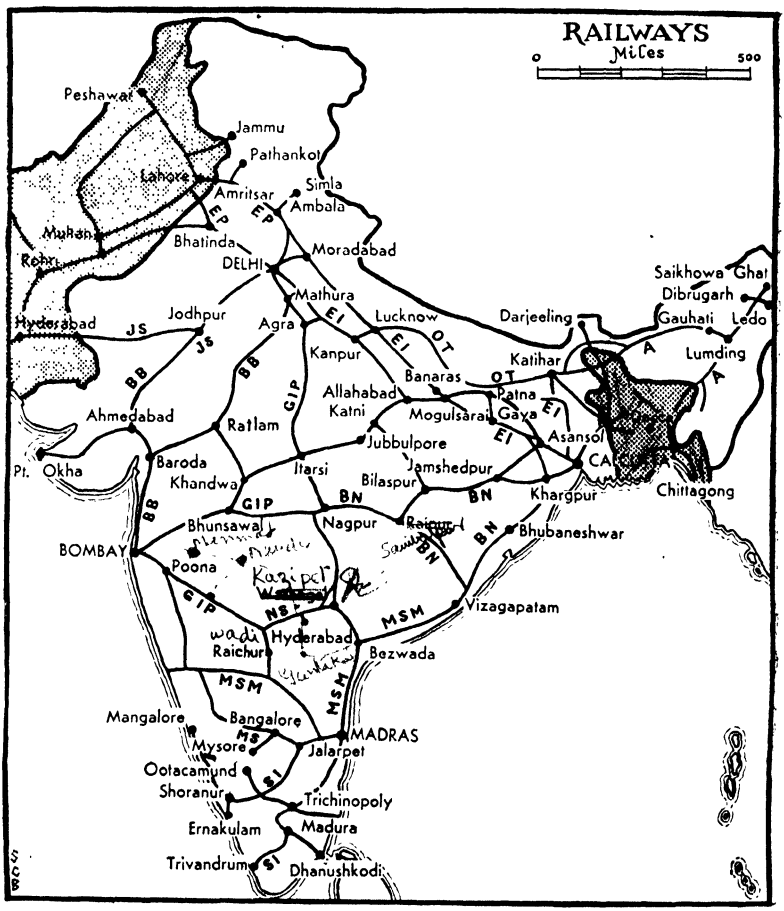
The following figures give the average number of rolling stock on the lines everyday:—

	1938-39	*1947-48*
Engines	7,940	7,565
Passenger coaches	30,500	23,339
Wagons	205,199	203,800

An account of the railway systems follows.

East Indian Railway: It has a route mileage of 4,350 miles, which includes the railway lines of West Bengal east of Bhagirathi-Hooghly which formerly belonged to Bengal Assam Railway. Its headquarters are in Calcutta. It serves the major portion of the Gangetic valley, namely the provinces of West Bengal, Bihar and Uttar Pradesh. The railway net is densest in this area and large numbers of passengers and heavy amount of goods are carried by the railway. It serves the hinterland of the port of Calcutta from where it took its start in 1854. It was soon extended to Raniganj coalfield. It now serves all the Damodar valley coalfields, the Asansol industrial area and the mica belt of Bihar. It brings jute, tea, coal, food, and building material to Calcutta, and takes back manufactured goods to its hinterland. Its main line connects Calcutta with Delhi via Burdwan, Asansol, Madhupur, Kiul, Mokameh, Patna, Buxar, Mogulsarai, Allahabad, Kanpur and Aligarh. But a short cut, over which the fast trains including the Calcutta-Delhi mail travel, is provided by the Grand Chord connecting Asansol and Mogulsarai via Dhanbad and Gaya. Another important main line of the system bifurcates from Mogulsarai and connects with Saharanpur on East Punjab Railway via

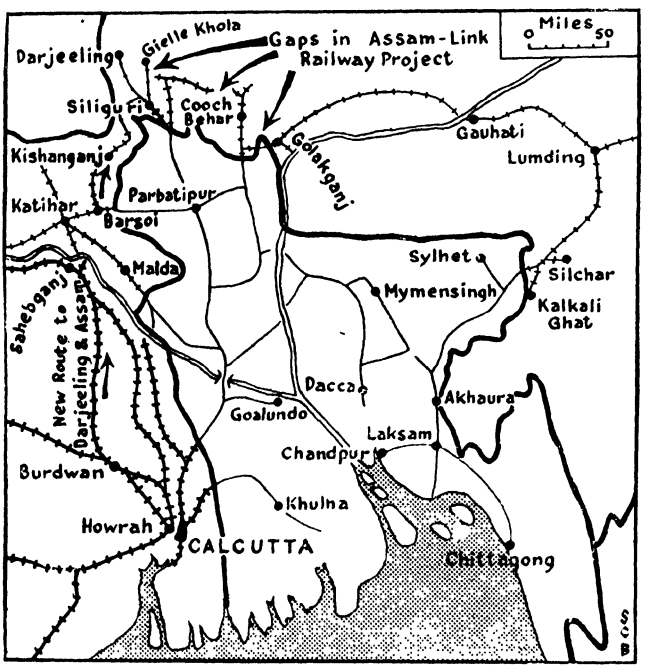
Banaras, Lucknow, and Moradabad. The railway serves the vast number of pilgrims who visit the religious centres of Gaya, Banaras, Allahabad, Mathura and Hardwar.



Map 47
Railways of India.

E P—East Punjab Railway; E I—East Indian Railway; O T—Oudh & Tirhut Railway; A—Assam Railway; B B—Bombay Baroda & Central India Railway; G I P—Great Indian Peninsula Railway; B N—Bengal Nagpur Railway; M S M—Madras Southern Marhatta Railway; S I—South Indian Railway; J S—Jodhpur State Railway; N S—Nizam's State Railway; P A K—Pakistan Railway.

Assam Railway: This railway system has recently been connected with the rest of India by the Assam Rail Link. It consists entirely of metre gauge lines 1,250 miles in length. A portion of the system lying south of the Brahmaputra has no connection with the lines in the north. Both are connected by a ferry across the Brahmaputra between Amingaon and Pandu. From Pandu the line runs via Chapramukh to Lumding. Here it bifurcates. A branch goes towards north east to Saikhowa Ghat via Tinsukia. Strategically this line serves the north-eastern

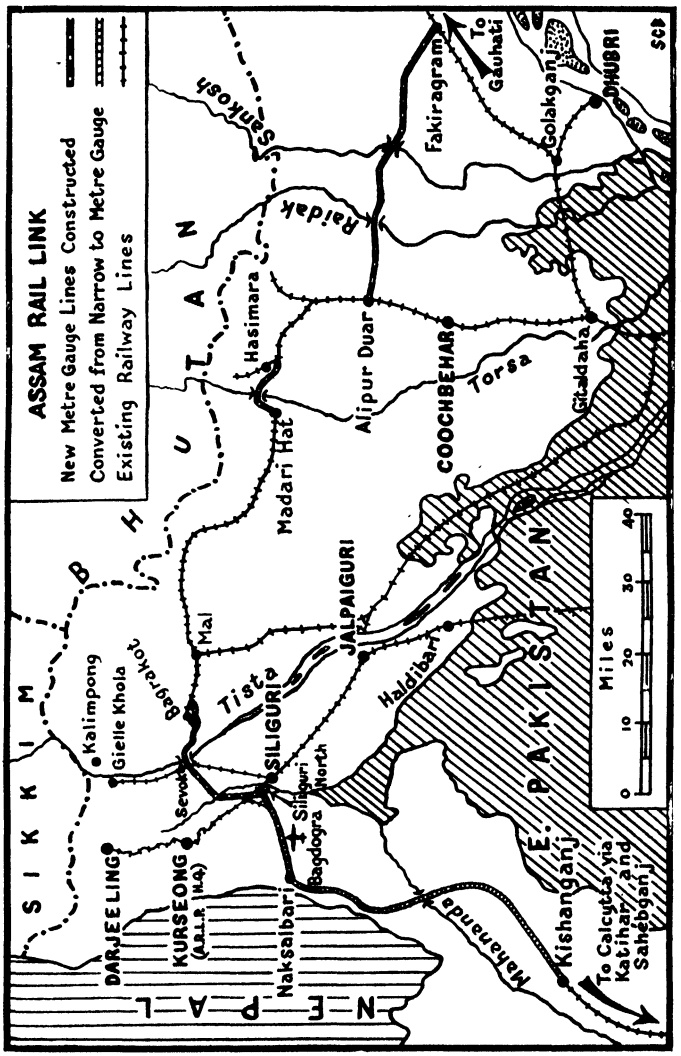


Map 48

Railways of E. India showing the gaps before the Construction of the Assam Rail-Link.

frontier and became the main supply line for the Burmese War Front in 1944-45. A branch goes to Dibrugarh from Tinsukia, and another to the oil fields of Digboi, the Burma Road terminus of Ledo and the timber centre of Margherita. It also serves the coal mines at Makum. These lines were badly damaged by the

great Assam earthquake in August, 1950. From Lumding the other line runs towards the south to Kalkali Ghat on Tripura



Map 49

border. A branch Joins with Silchar. The main line enters Eastern Pakistan and runs down to Chittagong. The Assam

railways carry timber, tea, oranges, pineapples, mineral oil and coal.

Assam-Link Railway: The construction of this railway became a necessity by the creation of E. Pakistan. The whole of Assam, Tripura, Cooch Behar, Sikkim, Bhutan and Jalpaiguri and Darjeeling (two districts of West Bengal) are connected with the rest of India by only a ten mile gap between Nepal and the north-western horn of E. Bengal. In Jalpaiguri and Cooch Behar unbridged rivers made three gaps in the railway line. Moreover above the Sarah Bridge on Padma, which is now in E. Pakistan, the next bridge over Ganges is at Banaras. Again a part of the line through the ten mile connecting gap south-west of Siliguri was narrow gauge. So the Assam Rail Link Project consisted of the following:—

(a) Conversion of the narrow gauge line between Kishanganj and Siliguri to metre gauge.

(b) Building of links in the following three gaps in Jalpaiguri: (i) Siliguri to Bagrakot; here a railway bridge was built over river Tista; (ii) Madarihat to Hasimara; this involved the building of a bridge over river Torsa, which is very turbulent; (iii) Alipur Duar to Fakiragram; here bridges were built over the rivers Sankosh and Raidak.

(c) Construction of a bridge over the Ganges. Regarding this there are three proposals. One of them is to build a bridge at Mokameh, another to build it at Sahebganj to join with Manihari Ghat on the opposite bank, and another is the construction of the multipurpose Ganga Barrage in West Bengal, over which the railway line to Darjeeling and Assam will pass. None of these bridges have yet been built. The proposal to build the bridge at Mokameh has gained favour.

Except the building of a bridge over the Ganges, the project was completed in December, 1949. An engine with two wagons moved from Siliguri North, a newly built railway station on the north bank of Mahananda, to Bagrakot on Dec. 10, 1949. A passenger service started on the whole link on 26th January, 1950. Unfortunately during a severe monsoon downpour, extensive landslides occurred in Darjeeling and Tista valley. The Tista broke its embankments at the ends of the newly built bridge, which

it is feared, may have to be made longer. The line, however, started working after temporary repairs. The line proved invaluable when disturbances broke out in E. Pakistan in the early part of 1950. In this respect it has a great strategic importance. For carrying tea, timber, jute, mineral oil, oranges and pineapples from Assam to the rest of India it is invaluable. Passengers to Assam and Darjeeling also use it. The line is yet unfit to carry all of this huge traffic, much of which is carried by air, including tea, jute and oranges. An offshoot of the new line is the conversion of the broad gauge line between Siliguri and the Pakistan border near Haldibari to metre gauge, and its connection with the new Siliguri North station over a new bridge over the Mahananda.

Bengal Nagpur Railway: This system has a mileage of 3,380 miles which serves the south-western part of West Bengal, Orissa, southern Bihar and eastern part of Madhya Pradesh. Its headquarters are in Calcutta. Its two main lines join Calcutta with Waltair and Nagpur. The B. N. R. system trifurcates at Khargpur. The central line proceeds to Jamshedpur, Bilaspur, Raipur and Nagpur. The next line proceeds towards the south-west to Cuttack, Berhampur (Ganjam) and Waltair. The third line goes northwards to Bankura, Adra and then through the coal fields to Gomoh. A branch line joins Jamshedpur with Asansol via Adra. Besides serving the port of Calcutta the system serves the newly rising port of Vizagapatam, with its ship-building yards. The main line from Calcutta and the branch line from Raipur serve the port, the latter bringing manganese from Madhya Pradesh for export. The system passes through areas rich in minerals, serving the iron mines of Bihar and the manganese mines of Madhya Pradesh. It also serves the southern portions of Bihar coalfields and the Iron and Steel towns of Jamshedpur and Burnpur. Besides it serves the great pilgrimage centre and sea resort of Puri.

East Punjab Railway. This system formed part of the North Western Railway before partition. It now has a route mileage of 2,900 miles, and has its headquarters in Delhi. Its main line now joints Delhi with Amritsar via Meerut, Saharanpur, Ambala, Ludhiana and Jullundur. The other main line goes from Delhi to Ferozepore via Rohtak, Jind, Jakhal and Bhatinda. Bhatinda is a big railway junction where five lines meet. This system does

not serve any mineral deposits. It has now a great strategic importance serving the frontier. The branch line to Pathankot serves the new road-link to Kashmir. A hill train goes from Kalka to Simla, a hill resort as well as the summer capital of India and East Punjab and capital of Himachal Pradesh.

Great India Peninsula Railway. The first railway train to move in India was from Bombay to Kalyan in 1853 on this line. Bombay is the headquarters of this system, and its routs mileage is 3,530 miles. It covers Madhya Bharat, western part of Madhya Pradesh and sourthern part of Bombay. The system serves a very large part of the hinterland of the port of Bombay. With the loss of Karachi the importance of Bombay has increased together with its communication lines. The other important function of the system is the movement of raw cotton to the textile centres and the opposite movement of cloth and yarn from them. The three main lines of the railway go to Delhi, Nagpur and Raichur (from where the M. S. M. connects with Madras) The line to Delhi passes through Bhusawal, Khandwa, Itarsi, Bhopal, Jhansi, Gwalior, Agra and Mathura. From Bhusawal the line bifurcates to Nagpur, from where the B. N. R. connects with Calcutta. From Itarsi a branch line connects with E. I. R. at Allahabad via Jubbulpore and Katni. The other main line proceeds from Bombay to Poona, Sholapur, Wadi and Raichur.

Bombay Baroda and Central India Railway. As a competitor to the G. I. P. R. this railway serves the port of Bombay and from here provides an alternative route to Delhi, and also serves cotton growing areas and cotton textile centres of Surat, Broach and Ahmedabad. The main line runs northwards from Bombay along the coast to Surat and Baroda and then to Ratlam, Kotah and Mathura. This line and a few of its branches consist of broad gauge. The other main line from Ahmedabad to Delhi is on metre gauge. It passes through Abu Road, (from where a road goes to Mt. Abu hill resort) Marwar, Ajmer, Jaipur, Bandikui, Alwar and Rewari to Delhi. The great disadvantage of this railway system is its two types of gauges. Besides serving Mt. Abu, the system with the adjoining state railways serves the pilgrim centres of Dwarka, Mathura and Ajmer (Dargah Sharif). Bombay is the headquartes of this railway and the route mileage is 3,400 miles. A branch line between Ratlam and Khandwa connects the system with G. I. P. R.

Madras & Southern Marhatta Railway. This system has nearly 3,000 miles of routes, with its headquarters at Madras. It serves the Deccan Plateau north of Madras town, which forms the northern portion of the hinterland of this port. Besides moving the agricultural produce of the Madras Province from producing areas to consuming centres and ports of Madras and Vizagapatam the railway serves various industrial units and mineralized areas, such as the Nellore mica belt. Tobacco, growing in the Krishna and Godavari deltas, groundnuts and castor seeds, and hides and skins move on this railway to the two ports. The railway also connects with the State Railways of Mysore and Hyderabad, and serves the great industrial centre of Bangalore and Kolar Fields. The main lines are:—(i) Madras, Bezwada, Waltair, (ii) Madras, Arkonam, Jalarpet, Bowringpet, Bangalore, (iii) Madras, Arkonam, Cuddapah, Guntakal, Raichur. Also from Guntakal the line proceeds via Bellary and Londa to Goa, thus crossing from coast to coast. Londa is further joined to Poona.

South Indian Railway. This system serves all the towns and ports south and west of Madras. Various agricultural products which move on this line are sugarcane, cotton, groundnuts, arecanuts, coconuts, spices, tobacco, rubber, tea and coffee. Besides these many forest products and fish manure are carried on this line. Textile and various other industries are also served by this line. Hill stations in the Nilgiris including Ootacamund and the famous pilgrimage centres of the south including Trichinopoly, Tanjore, Madura and Rameswaram are served by this system. The ports served by it include Madras, Negapatam, Dhanushkodi, Tuticorin, Quilon, Cochin and Mangalore. Its main broad gauge line connects Jalarpet with Mangalore via Salem, Erode and Shoranur. Branch lines go from Erode to Trichinopoly and from Shoranur to Cochin. All lines south and east of this line are on metre gauge. Here the main lines run from Madras to Villupuram, Tanjore, Trichinopoly and Madura. From here one line goes to Shencottah, Quilon and Trivandrum and the other to Dhanushkodi. The total route mileage of this system is 2,350 miles and the headquarters is at Trichinopoly.

Zonal Distribution of Railways

Recently the Government has proposed to break the present systems of railways and regroup them on a rational basis. The following six zones have been proposed:—

The first zone, Northern Railway, will consist of the E.P. Railway, the western portion of the E. I. Railway between Lucknow-Kanpur and Delhi-Saharanpur, and the metre gauge portion of the B. B. and C. I. Railway between Agra and Kanpur and the O. T. Railway west of Chupra.

The second zone, Western Railway, will consist of the metre gauge portion of the B.B. and C.I. Railway, except the Kanpur-Agra section and the States Railways of Saurashtra, Jodhpur, Bikaner, Jaipur, Rajasthan and Kutch. In this zone, consideration has been given to the development needs of Kandla port and the business and economic connections of Saurashtra etc., with Rajasthan.

The third zone, Central Railway, will consist of the broad gauge section of the B.B. and C.I. Railway a major portion of the G.I.P. Railway and the Scindia and Dholpur State Railways. In this zone, the alternative routes from Bombay to Northern India and the lines of communication between Bombay and the industrial areas around it have been placed under one administration.

The fourth zone, Southern Railway, will consist of the S. I. Railway (both broad gauge and metre gauge), major portion of the broad gauge and entire portion of the metre gauge of the M and S. M. Railway, and the entire Mysore State Railway. Both geographically and from the point of view of railway operation, grouping together of all southern railways is the ideal arrangement.

The fifth zone, Eastern Railway, will consist of the N. S. Railway, portions of the G. I. P. and M and S. M. Railways and the B. N. Railway, excluding the coalfield area of Bengal and Bihar and the Howrah-Khargpur section.

The sixth zone, North Eastern Railway, will consist of the E. I. Railway east of Lucknow-Kanpur, the coalfield area of Bengal and Bihar at present with the B. N. Railway, its Howrah-Khargpur section, the O. T. Railway east of Chupra, and the Assam Railway, including the Assam Rail Link and the Darjeeling-Himalayan Railway.

The principles governing the above zoning have been given as:—

1. Every railway administration should serve as far as possible a compact region.

2. It should be large enough to provide an HQ organization of the highest calibre capable of following and assimilating up to date improvements in railway techniques and equipped with adequate workshop facilities and statistical training and research institutions.

3. Regrouping should cause the minimum dislocation in existing arrangements and should be so phased as to prevent any kind of dislocation or even temporary diminution of the quantity or efficiency of railway service.

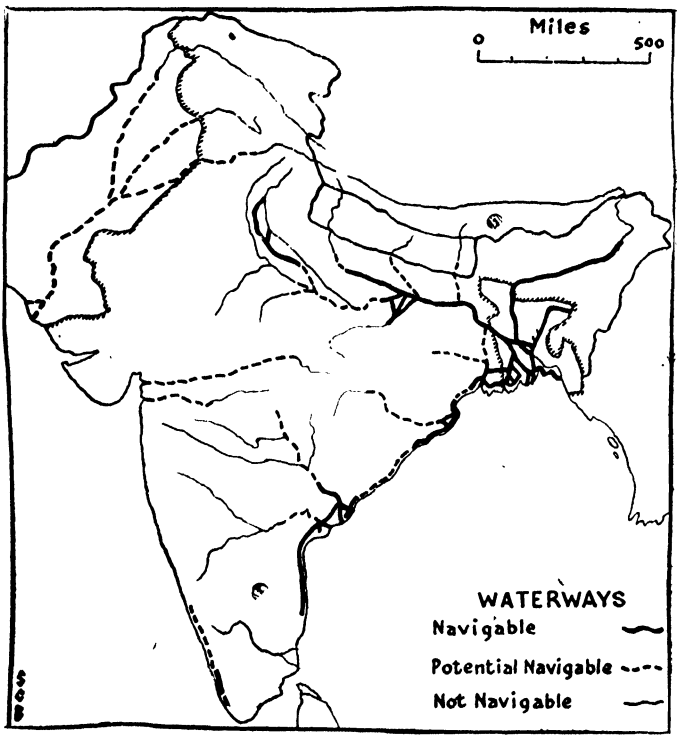
4. While the existing proposals do not indicate the nature of the internal administration of each group viz., whether it should be on a Divisional or District system, it is not proposed to adopt a dogmatic attitude in the matter and the vital necessity of causing minimum dislocation will also govern the decision on this important issue.

The present railway systems grew up haphazardly and a regional zoning, as proposed by the government is sure to be highly beneficial in the long run. It may cause a certain amount of dislocation in the beginning, but this should not stop the government from going ahead with the zoning scheme.

Inland Water Transport

Judged by relative standards of the times, there is no doubt that in pre-railway days, inland navigation in this country was highly developed, but unfortunately, this form of transport has not progressed in parallel with road and rail development as in many other countries. There are several reasons for this, but the lack of co-ordinated authority to maintain the waterways, and provide navigational facilities has been the greatest impediment to the development of our waterways, which nature has provided in such abundance throughout India. The provision of navigable conditions over our waterways is the first essential to induce industrial and agricultural traffic to use the cheapest and quickest form of transport for heavy goods and bulk cargoes, which navigation undoubtedly provides.

If the industrialisation visualised for India is to succeed, she must provide herself with the most economical form of transport, as other progressive nations have done in the past. In the development of waterways, the allegation of harmful competition with the railways must not be allowed to pass unchallenged. It is a



Map 50

fallacy to suppose that the two forms of transport cannot be developed simultaneously, when we have the outstanding examples of their successful developments side by side, in France, Belgium, Holland, Germany, Austria, Russia and the U. S. A.

The great rivers and canal systems of India must be developed and maintained for navigation, so that her products may be carried by the most economical means, from the interior to her ports, both for internal distribution and export to world markets. James

Rennell in his 'A map of Hindoostan' published in 1792, wrote 'The countries between Delhi and the river Panjab being scantily supplied with water the Emperor Ferose III (1355) undertook the noble task of supplying water for the purpose of navigation. These canals had for their immediate object the junction of the Sutlege and Jumna Rivers, and remotely that of the Indus and the Ganges.'

Rennel also recorded his opinion of the possibility of a trans-continental waterway for navigation by joining the Narbada and the Son river.

We also have the reconnaissance report of Lieutenant Haig, dated 1856 wherein the navigability of the Godavari, Pranhita and Wardha series of rivers through Madras, Hyderabad, and Madhya Bharat, for a distance of approximately 400 miles inland from the sea, is put forward as a practical proposition.

That none of the imposing schemes mentioned above saw the light of the day was doubtless due to the advent of railway, whereby enthusiasm, created by the novelty of speed must have obscured the economics of transportation. Had the same enthusiasm been accorded to application of power to river craft the story of inland water transport in India might have been a very different one today.

Inland navigation in India, with steam vessels, was first started on the Hooghly in 1823, when the 'Diana', 89 tons, carried passengers from Kulpi roads to Calcutta, a distance of about 50 miles. In 1842 a service was started by the India General Navigation Company Ltd. between Calcutta and Agra. Ferozepore was an important centre of trade on the Sutlej, which was navigable up to Ludhiana. All these rivers are un-navigable today, and steamers seldom ply on the Ganges up-stream of Patna.

Navigable Waterways: Canal navigation is still active in the Madras Presidency, where the important waterways are the Godavari canals, the Krishna Canals, the Buckingham Canal, the Kurnool Cuddapah Canal and the West Coast Canal. The Godavari, the Krishna, and the Kurnool-Cuddapah Canals are used both for navigation and irrigation, while the others are intended for navigation only. In the Godavari and Krishna deltas, the navigable canals are the main highways, and afford a cheap and ready mode

of access to all markets. The Buckingham Canal has played an important part in the trade of the country traversed by it, and in particular, during the last War when the traffic was heavy, and afforded considerable relief to railways. On the West Coast in Malabar the lagoons running parallel to the coast form the chief means of communication and transport. There are some 250 miles of navigable canals in use in Orissa.

The total length of waterways in India affording perennial flow amounts to about 20,000 miles, comprising 8,000 miles of rivers and 12,000 miles of canals. Of the former, approximately 3,000 miles are navigable to a minimum of about three feet draught, and of these about 2,000 miles are in W. Bengal and Assam. The canals are mostly for irrigation, but it is estimated that about 3,000 miles would be suitable for power-driven craft, and the remaining 9,000 could be utilised for boat traffic.

Water-borne traffic:—The amount of boat traffic over Government maintained channels has been estimated to about 250 million ton-miles per annum, which is approximately one per cent of the pre-war goods traffic by railways. It is therefore obvious that, as matters stand today, inland water transport forms an insignificant proportion of the nation's transport services, yet during the late war, its strategic value was emphasized by the fact that the Burma campaign could not be started, until supplies were assured by inland water transport.

Investigations are now in progress in order to assess the economy of country boat traffic throughout India and to obtain a census of craft. The most important waterways are found in the North East and the records of imports and exports into and from Calcutta show the extent to which the trade of the largest seaport in India depends upon its waterway communications. Dealing first with imports, approximately 25 per cent of the merchandise, which flows into Calcutta from the rest of India is water-borne. As regards export out of Calcutta about 32 per cent is carried by water. The total inland water-borne trade of Calcutta amounts to approximately 45,00,000 tons, of which about 34 per cent is carried by inland steamers and 66 per cent by country boats.

The question of improving India's natural waterways is receiving the close attention of local governments and the Central

Waterways, Irrigation and Navigation Commission is endeavouring to co-ordinate these efforts on a country-wide as well as multi-purpose basis. It is deplorable that, in many areas, navigation has been almost completely neglected for the over-ruling benefits of irrigation, and rivers, which formerly afforded perennial navigation have, in consequence, been reduced to diminutive streams during the dry season. The Jamuna which was navigable to Agra 100 years ago is not navigable now; and the Ganges which was navigable to Kanpur 50 years ago is now navigable only a short distance upstream of Patna. Possible extensions of navigation can only obtain fruition by consideration of multi-purpose use of our water wealth on a regional basis irrespective of political boundaries. *Fundamentally inland navigation always has been and always must be a regional matter.*

Conservation of water resources on a multi-purpose basis offers the following potential new navigable waterways, or the resuscitation of old ones:—

West Bengal

(a) A new canal to connect the coal-fields of W. Bengal and Bihar with the port of Calcutta.

(b) Resuscitation of the Bhagirathi route to the Ganges.

Assam

Resuscitation of the Dihing, Dikhu, Dhansiri and Kalung rivers in the Upper Assam.

Bihar

(a) Resuscitation of the Gandak and the Kosi series of rivers.

(b) Extension of navigation on the Son River for about 150 miles.

Uttar Pradesh

(a) Resuscitation of the Gogra river up to Fyzabad as prevailed in former days.

(b) Navigation on the Jamuna river from near Etawah to Allahabad, and on to Calcutta via the Ganges.

Madhya Pradesh

The potentialities of the Narbada and Tapti to be investigated.

Madras

Possible development of the Godavari, Pranhita, Wardha and Wainganga rivers, and the possible development of the Tapti river to obtain a trans-continental line by connecting the Tapti and Wardha rivers.

Orissa

(a) The Orissa Coast Canal between the Hooghly and the Dhamra rivers together with an extension of the Mahanadi delta system, to link with the Madras Canal System to afford inland navigation from Madras to W. Bengal.

(b) Navigational facilities on the Mahanadi river to Sambalpur approximately 300 miles from the sea.

An inland navigation expert was invited by the Government in February, 1950 to investigate the possibilities of navigation on seven stretches of waterways in the following order of priority:—

(1) The Ganges from Buxar to Allahabad
(2) The Gogra up to Bahramghat
(3) The Rapti up to Gorakhpur
(4) The Bhagirathi
(5) The Mahanadi and the Orissa coastal canal
(6) The Tapti up to a point 50 miles above Kakrapa
(7) The Buckingham Canal.

The investigation was to indicate the minimum volume of traffic needed, efficient methods of operation, suitable types of craft and shore installations.

It is now fully recognized by the Government that the industrial development of the country may increase the traffic in goods and passengers so much, that the roads and the railways may not be able to cope with it. *Improvement of inland waterways was therefore considered as a necessary phase in the planned development of the country.* As for example the rapid industrialization now in progress in U. P. will rapidly need greater traffic facilities. A new paper factory at Chhitauni ghat will require 80,000 tons of coal per year. A new rayon factory to be established at Naini near Allahabad will need 40,000 tons of coal, 15,000 tons of salt and 5,000 tons of wood pulp per year. The product 4,000 tons of rayon, will also have to be carried to the consuming centres.

The Central Waterways Irrigation and Navigation Commission surveyed the Ganges from Buxar to Allahabad and the Gogra. They were optimistic about establishing navigation on them.

Finally it may be said that the development of inland waterways will soon become a crying need, as traffic rapidly increases in the wake of our developing industries. It is encouraging to note that a unified Ganges navigation scheme is now under consideration, which will allow for a direct steamer service through canalized Bhagirathi and Ganges between Calcutta and Allahabad. The scheme is to follow the model of the Rhine Navigation system in Germany.

Airways

Civil aviation in India began in October, 1932 when the first scheduled service between Karachi, Bombay and Madras was inaugurated for carrying the airmail transhipped from the Imperial Airways plane from London. The progress of civil aviation was very slow till the first World War started.

Geographic Factors

There are many special geographical advantages which India enjoys for the development of airways. They are:—

(a) The large size of the country with long distances to be covered.

(b) The meagre development of other means of transport.

(c) The position of India in the old world is such that all the International air routes have to pass through India. In Central Asia and Siberia long distances have to be crossed over deserts or cold, bleak lands. So the routes are diverted through India.

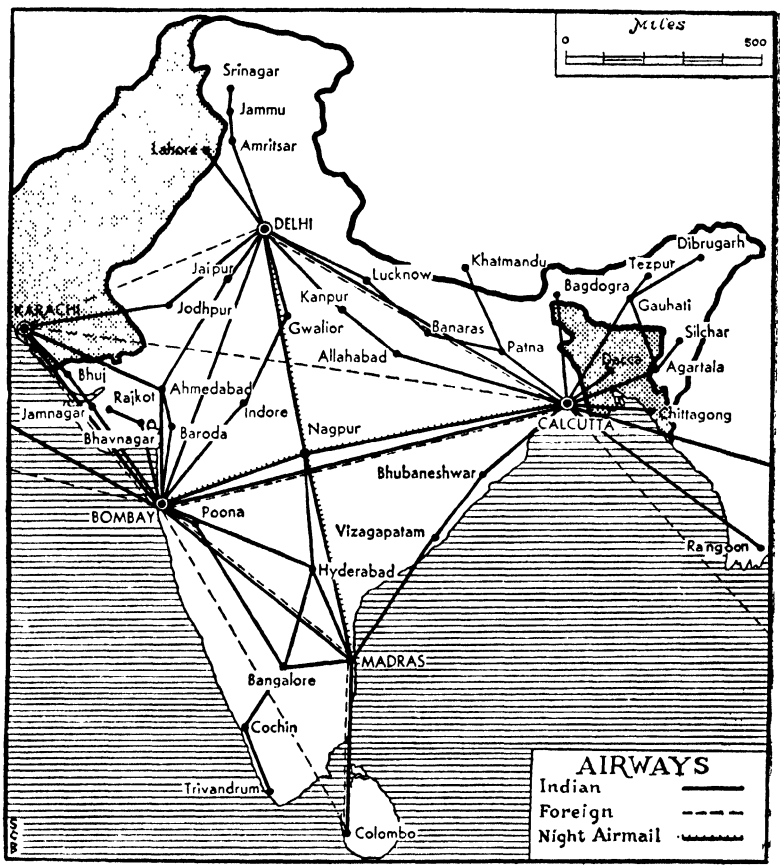
(d) The Weather in India during winter is ideal for safe air navigation.

(e) Extensive deposits of bauxite occur in the country and await the development of hydro-electric power for being turned to aluminium, which will be used for building the bodies of aircraft.

(f) There is every hope of finding suitable types of wood in the Himalayas for constructing aircraft blades and bodies.

Civil Aviation in 1938 *

The mileage of regular routes at the end of 1938 was only 6,700 miles, compared to 25,477 of Britain, a much smaller country, 88,301 of the British Commonwealth, 71,199 of the U. S. A. and 40,833 of France.



Map 51

The number of civil aerodromes open to public use numbered only 37, of which 19 belonged to the Government and 18 to the

* India's Plans for expanding Civil Aviation by T. P. Bhalla, Director General of Civil Aviation, Government of India: from the Statesman, 26th January, 1950.

States. They were mostly landing grounds 800 to 1,000 yards long. The Posts and Telegraphs Department provided medium frequency communication and direction finding aids and the Meteorological Department weather information There were only 48 officers and 205 others, employed in the Civil Aviation Directorate to man its headquarters and airports.

Three scheduled airlines, Tatas, Indian National Airways, and Air Services of India operated in 1938 only seven internal services with a total fleet of 29 small aircraft of different makes and a total staff of 324, of whom 27 were pilots and 30 engineers. The trans-India air route as well as the international air routes were operated, by foreign airlines. In 1938, the Indian airlines flew 1,500,000 miles, carried 500,000 lbs. of mails 100,000 lbs. of freight, and 3,000 passengers, ridiculously small for a big country like India. The airlines were not subsidized but they received Postal contracts on generous terms and were exempted from landing and housing fees. They got most of their pilots and engineering staff from the seven Government subsidized flying clubs and three State clubs which were turning out on an average 100 pilots and 50 engineers per year.

Development during World War I

On the eve of the war, India had 122 European and 1,136 Indian personnel employed in civil aeronautical organizations, consisting of administrative officers, pilots, engineers, wireless operators, and clerks. Besides these there were about 1,000 holders of pilots' licences, mostly "A", and 156 aircraft, of which 99 held Certificates of Airworthiness. Civil aviation, recognized as the second line of national defence, was poorly equipped. Nevertheless it provided a nucleus round which, when Japan entered the war, the R.A.F. and the U.S.A.F. built up a magnificent and considerable air organization in the country.

The snail's progress was superseded by the hare's race and hundreds of aerodromes with concrete runways, modern communication and navigational equipment including radar, large hangars, taxi tracks, and dispersal units grew up all over the country. The Hindustan Aircraft Factory and civil maintenance units were run by Government; thousands of men got employment

and technical training and hundreds of aircraft single, twin, and four-engined were based on India.

Civil Aviation was suspended during the war but a post-war plan of development costing Rs 16 crores spread over 10 years was prepared. The Department was also reorganized and seven Directorates—Air Routes and Aeronautical Inspection, Regulation and Information, Air Transport, Training and Licensing, and Administration—were established under a Director-General assisted by two deputies to deal with each aspect of aviation. The Government, also in 1946, dicided to establish an Air Transport Licensing Board to consider applications of airlines for new routes.

Post War Development

The large profits made by Tatas and I.N.A. during the war and the post-war boom led to an indiscriminate rush for floatation of new companies. There was a phenomenal rise in traffic and as against the seven internal routes of 1938, there were 41 internal air routes.

The following figures give an idea of the rise in air transport.

Year.	*Hours flown.*	*Miles flown.*	*Passengers carried.*	*Freight carried.*	*Mails carried.*
1945	21,781	3,320,277	24,090	852,068	480,616
1946	29,539	4,520,046	105,251	1,318,153	1,026,403
1947	59,301	9,361,673	254,960	3,868,546	1,405,073
1948	78,961	12,648,765	341,186	8,156,471	1,582,645
1949	93,000	14,900,000	358,000	13,300,000	4,900,000

The phenomenal rise in miles flown entailed a revision of the post-war plan of 1943-44 and a revised plan envisaging an expenditure of Rs. 56 crores spread over 10 years is under consideration. The strength of the Civil Aviation Directorate rose from the small numbers of 1939 to about 450 officers and 5,000 men. A Civil Aviation wing of the CPWD was also organised for the construction of development works. Forty-seven airports are run by the Civil Aviation Directorate and with effect from April, 1950 the number increased by 21 more by acquiring landing grounds in Saurashtra, Rajasthan and Madhya Bharat.

Runways have been extended, new ones planned, available communication equipment acquired and set up as well as training institutions for pilots, communication officers, and aerodrome officers. There are proposals also for the purchase of the latest lighting and communication equipment. India is also a member of the International Civil Aviation Organization. As compared with an expenditure of a few lakhs in 1939, the annual budget now is about Rs. 6 crores. After the completion of the present plans India will have four international airports, 47 major, 32 intermediate, and 57 minor aerodromes. These are not too many for a big country like India with its ideal climate and long distances and inaccessible areas particularly suited to civil aviation.

The possibility of development of fair weather runways in inaccessible areas to bring their produce to market needs exploration. Freight traffic has still large possibilities of growth. The programme has unfortunately been retarded because of the financial difficulties which are now hampering the airlines.

All possible help is being given to encourage private flying through Flying Clubs. At present the seven Flying Clubs at Delhi, Bombay, Calcutta, Madras, Patna, Bhubaneshwar and Lucknow receive subsidies and grants from the Government of India. It is proposed to have three more subsidised Flying Clubs at Jullundur, Nagpur and Assam so that each State will have one club. Flying schools have been established at Allahabad and Barrackpore.

Air transport is still in the development stage with rapidly changing types of aircraft requiring considerable capital outlay. The total private capital invested, however, is only about Rs. 6 crores. But it is now fully realized that for its commercial as well as its defence needs India requires a well-developed and expanded civil aviation keeping abreast with the developments that are rapidly taking place in this field. Being a comparatively poor country we cannot follow exactly the technique and methods of richer countries and we will have to evolve a system suited to our genius and circumstances.

Bilateral air agreements: India has further strengthened her position on the world air map by entering into bilateral air agreemeents with her neighbours Pakistan and Ceylon, and with

Sweden, Norway, Switzerland, France, Netherlands, U. K., U. S. A., China, Egypt, Iran, Philippines and Australia.

External Air Services

The inauguration of India's external air service between Bombay and London marked a milestone in the country's progress in air transport. A new company, Air India International Ltd. was formed by the Government of India as a joint State *cum* private enterprise with an authorised capital of Rs. 2 crores. Of this the Government of India's share amounted to 49 per cent with an option to acquire at any time a further 2 per cent. As the largest share-holder the Government have effective control over the policies and operations of the company. The day to day management is left to Air-India Ltd., a well established and experienced Indian concern. The latest long range four-engined 'Constellation' type of aircraft, which have a maximum speed of 300 miles per hour, were bought for the operation of this service. The first flight was made on June 8 from Bombay to London with intermediate halts at Cairo and Geneva. The same company is now operating another route from Bombay to Aden and Nairobi. The Bharat Airways are operating a service between Calcutta and Bangkok. Other foreign services are to our neighbours. They include services (a) from Delhi to Lahore and Karachi; (b) from Bombay to Karachi; (c) from Calcutta to Dacca and Chittagong; (d) from Calcutta to Rangoon; (e) from Madras to Ceylon; and lastly a new service (f) from Calcutta to Khatmandu via Patna.

Recent trends. In recent months air traffic disclosed a decline by 7%. Many companies were forced to reduce their fairs to attract more passengers. They were mostly running at a loss. There has, however, been a steady development in air mail services. The *night air mail* has proved a success. It is also attracting a larger number of passengers by offering cheaper rates. Under this scheme planes from Delhi, Calcutta, Bombay and Madras fly to Nagpur, in the first half of the night, exchange mail bags and return to the four cities in the early hours of the morning. An all-up mail service plan is gradually gaining momentum.

Air routes.

The following is the list of air companies and the routes covered by them in June, 1950:—

(i) *Indian National Airways*:
- (a) Delhi-Calcutta.
- (b) Delhi-Amritsar—Jammu—Srinagar.
- (c) Delhi-Lahore.
- (d) Delhi-Jodhpur-Karachi.
- (e) Calcutta-Rangoon.
- (f) Calcutta-Patna-Khatmandu.

(ii) *Air India (Tata Line)*:
- (a) Bombay-Delhi; Bombay-Ahmedabad-Jaipur-Delhi.
- (b) Bombay-Baroda-Ahmedabad.
- (c) Bombay-Karachi; Bombay-Ahmedabad-Karachi.
- (d) Bombay-Calcutta; Bombay-Nagpur-Calcutta.
- (e) Bombay-Madras.
- (f) Madras-Bangalore-Coimbatore-Cochin-Trivandrum.
- (g) Bombay-Hyderabad-Madras-Colombo.
- (h) *Air India International*: Bombay-Basra-Cairo-Geneva-London.
- (i) Bombay-Aden-Nairobi.

(iii) *Bharat Airways*:
- (a) Calcutta-Allahabad-Kanpur-Delhi.
- (b) Calcutta-Patna-Banaras-Lucknow-Delhi.
- (c) Calcutta-Chittagong.
- (d) Calcutta-Agartala-Gauhati-Tezpur.
- (e) Calcutta-Bangkok.

(iv) *Airways (India) Ltd*:
- (a) Calcutta-Bhubaneshwar-Vizagapatam-Madras-Bangalore.
- (b) Calcutta-Dacca.
- (c) Calcutta-Bagdogra (Siliguri).
- (d) Calcutta-Gauhati-Mohanbari (Dibrugarh).

(v) *Indian Overseas Airlines*:
(a) Calcutta-Nagpur-Bombay.

(vi) *Air Services of India*:
(a) Bombay-Indore-Gwalior-Delhi.
(b) Bombay-Jamnagar-Bhuj-Karachi.
(c) Bombay-Poona-Bangalore.
(d) Bombay-Bhavnagar-Rajkot.

(vii) *Deccan Airways*:
(a) Hyderabad-Bombay.
(b) Madras-Hyderabad-Nagpur-Delhi.
(c) Hyderabad-Bangalore.

(viii) *Himalayan Aviation Ltd. (Night Airmail)*:
(a) Calcutta-Nagpur-Bombay.
(b) Madras-Nagpur-Delhi.

(ix) *Kalinga Airlines*:
(a) Calcutta-Agartala-Silchar.

Foreign Air-lines through India:

(i) *British Overseas Airways Corporation*:
(a) London, Karachi, Delhi, Calcutta, Rangoon and Tokyo.
(b) London, Karachi, Calcutta, Singapore and Sydney.
(c) London, Karachi, Bombay, Colombo.

(ii) *Pan American Airways*:
(a) Calcutta, Bangkok, Seattle.
(b) Calcutta, Delhi, Karachi, London, Newyork.

(iii) *Quantas Empire Airways*: London, Calcutta, Sydney.

(iv) *Trans World Airways*: Bombay, Paris, Newyork.

(v) *Air Ceylon*: Colombo, Trichinopoly, Madras, Bombay, Karachi, London.

(vi) *K. L. M. Dutch Line*: Amsterdam, Karachi, Calcutta, Bangkok, Batavia.

(vii) *China National Airways Corporation*: Calcutta, Rangoon, Kunming, Hongkong.

(viii) *Air France*: Paris, Karachi, Calcutta, Saigon.

(ix) *Ethiopian Air-lines Incorporative*: Bombay, Karachi, Aden, Addis Abeba, Nairobi.

(x) *Iranian Airways*: Bombay, Karachi, Teheran.

(xi) *Philippine Airlines*: Amsterdam, London, Karachi, Bombay, Calcutta, Manila, Tokyo.

(xii) *Scandinavian Air-lines System*: Oslo, Stockholm, Karachi, Calcutta, Bangkok.

(xiii) *Braathen's S. A. F. E.*: Oslo, Karachi, Bombay, Calcutta, Hongkong.

(xiv) *Orient Airways*: Karachi, Delhi, Dacca.

Besides this route there are services from Karachi to Delhi, and from Chittagong and Dacca to Calcutta.

The list given above only deals with scheduled air routes, Indian and foreign. There is much air traffic by chartered planes in passengers as well as freight besides the scheduled services.

Shipping

India was a great sea-faring nation, not only in ancient times, but even during the regime of the East India Company. Her ships, in the past, sailed to distant lands. Alexander possessed hundreds of ships built in India. Calcutta and Bombay were famous ship-building centres in the seventeenth century. But with the advent of steel ships, and the rise of new sea-faring nations her supremacy in sea trade was lost.

In 1922, according to the suggestion of the Indian Mercantile Marine Committee a training ship "Dufferin" started training personnel for service in Indian ships. Between 1927 and 1945 it trained 772 cadets. In 1928 Mr. S. N. Haji introduced a bill in the Central Legislature for the reservation of coastal shipping for Indian vessels. But his attempts ended in failure.

Just before the second World War, Indian ships were carrying about one-third of her coastal cargo. In the six-year period

1933 to 1939, the average cargo carried per year on the coast was 7 million tons. Of this only 1.8 million tons was carried by Indian ships.

Since Aug. 1946, the Government has been following a vigorous policy to put Indian shipping on a firm footing. The Reconstruction Policy Sub-Committee on Shipping tendered a report in 1947, setting up targets to be achieved in 7 or preferably 5 years. The target tonnage of ships is 2 million tons, when it should be possible to take over 100% of coastal trade, 75% of trade with Burma, Ceylon and Pakistan and 50% of trade with all the other foreign countries. In 1939 the Indian tonnage was only .2% of the world tonnage. But it has increased steadily since then, as the following figures show:—

1939	.14 m tons	1948	.35 m tons
1946	.13 m tons	1949	.40 m tons

The percentage of the share of Indian shipping in coastal trade has also increased, as shown below:—

1939	33%	1949	.... 62%
1948	53%	1950 (first quarter)	.... 75%

In the sphere of foreign trade, the Government decided to float three shipping corporations, with a majority of Government share, with the co-operation and management of private concerns. The Government purchased two "Victory" ships in 1949 from Canada at a cost of $625,000 each. They have been plying between India and Australia, under the operation of the Scindia Steam Navigation Company on behalf of the Government. It was proposed to purchase and charter more vessels. On 11th March, 1950 the Government signed agreements with the Scindia Steam Navigation Company for the management of *the first Government sponsored shipping corporation,* which will have an authorized capital of Rs. 10 crores, of which 74% will be subscribed by the Government. The ships under the corporation will ply between India and Australia, East Africa, Malaya and the Far East.

In 1949 development in foreign trade by Indian ships began by starting of a regular cargo service to U. K., Europe and North America, and a fortnightly passenger service to U. K.

The Indian shipping concerns were at present facing many difficulties. Countries like Britain, France and Italy had recouped their war losses in tonnage. Japan was also to be allowed to rebuild her lost tonnage. On the Indian coast the number of shipping companies had more than doubled. Indo-Pakistan trade had greatly dwindled. Devaluation of the rupee had seriously retarded the overseas movement. Operation costs remained at a high level, but freight rates in some cases had decreased. For example rice freight from Colombo or Rangoon came down from Rs. 34 to Rs. 25. Government help in the form of subsidies seemed, therefore, necessary. State aid to shipping was given in other countries. The U. S. A. paid subsidies to her shipping amounting to 58 million dollars in 1949. The U. K. assisted her coastal shipping by about £ 500,000 in the same year.

The Government is indirectly susidizing the ship-building yard at Vizagapatam by giving orders for building ships at a much higher cost than the purchase price from the U. K. French experts, who visited the yard recently, declared that it was bound to turn out to be one of the best in the world. The Government realized that the yard was a national concern, and that it was the duty of the Government to see that it was not compelled to close down.

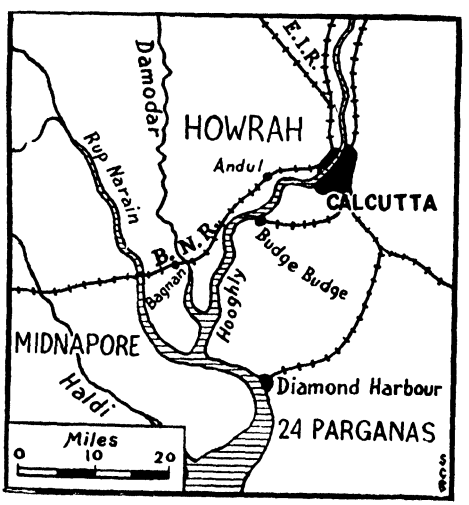
The Government has further started work on the construction of a major port at Kandla, while the construction of another major port between Bombay and Cochin was under consideration. On the whole, there seemed to be a bright future for Indian shipping.

PORTS

India with her long coast line and her strategic position in the Indian Ocean, has very few well developed ports. The coast line specially around the Bay of Bengal is not broken. With Karachi and Chittagong gone to Pakistan, India has only four first class ports, namely Calcutta, Vizagapatam, Madras and Bombay. Of them Calcutta is eighty miles away from the sea on the rapidily silting Hooghly river. Thus the need for developing some ports is very urgent. The western coast is now left with one port and the need of developing one or two ports on this side is being keenly felt. Cochin was developed somewhat during the war.

The suitability of developing Karwar, Bhatkal or some Kathiawar port is being examined. The western coast is rocky at many places and fewer big rivers pour mud in the Arabian Sea than in the Bay of Bengal. As the foreign trade of India develops, it will become more and more difficult for the four ports to handle all the traffic. The ports have very large hinterlands which are densely populated. So the haulage of goods on the land has to take place over long distances. As the number of ports increases the land haulage distance will be shortened. On the whole it seems that many ports will be found suitable for development, for conditions are better than the port of Calcutta in many smaller and yet undeveloped ports. A description of some important ports follows.

Calcutta: Job Charnock first discovered a deepwater channel along the eastern bank of Hooghly near the Kalighat Temple, and



Map 52
Situation and Communication links of Calcutta.

it was then that Calcutta began its post village career as a port on the eastern bank of a deep river, where there was good anchorage and a narrow crossing. The port now extends from Serampore up stream to the oil-wharf of Budge Budge, and dotted all along with jetties, ware-houses and industrial units. Five Dry Docks

are also available for repairing ships. Large ships cannot go above the new Howrah bridge. Before the construction of Kidderpore docks half a century ago, Calcutta was essentially a jetty port. It is just possible, at spring tides, for vessels drawing thirty feet to reach the docks, but the normal limit of draught is twenty seven feet. Yet many a ships break their back on the James and Mary Sands inspite of the costly pilotage service and dredging operations. But the future of this big port is gloomy if the river Hooghly continues to silt up at the present rate. The Ganga Barrage scheme will divert more water into the river and clean up the Channel.

Another scheme is to dig a *ship-canal* from Diamond Harbour to Kidderpore Docks. This will make a short cut to the sea. It will do away with dredging and pilotage and provide a permanent passage for ships. But it will go over a very rich agricultural land which is densely populated, and is included in the green belt round Calcutta providing vegetables and milk. Also Hooghly will have to be dredged for other reasons. Being the westernmost distributary of the delta, Hooghly receives Mor, Ajay, Damodar and Rupnarayan on its west bank. All these rivers bring enormous silt-laden flood water during rains, and if Hooghly channel is silted up, there is every chance of Calcutta being flooded.

The hinterland and communication lines of Calcutta have both been affected by the creation of Eastern Pakistan. Sooner or later as the port of Chittagong develops, the whole of Eastern Pakistan will become its hinterland, and perhaps even Tripura and part of Assam may use it profitably. The communication lines of Calcutta to the tea gardens of North Bengal and jute ports on the rivers of East Bengal will have all to be planned afresh to meet the new conditions, for the eastern part of the hinterland of Calcutta is being cut away.

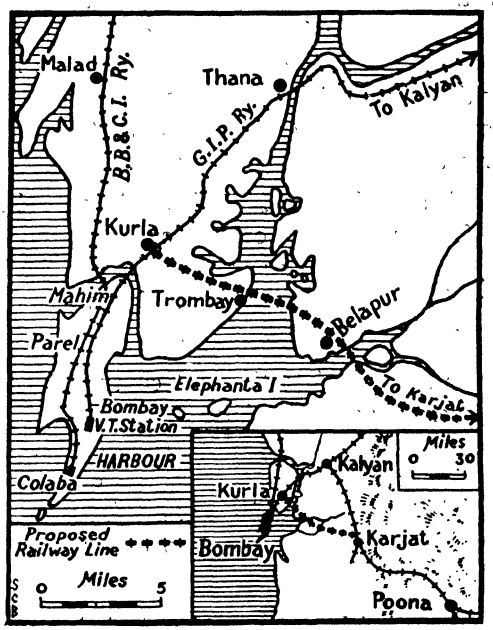
Calcutta is served by the E. I. R. and B. N. R. railway systems and numerous navigable waterways. The coal fields being only 130 miles away, coal can be easily supplied for water transport. Inspite of all the handicaps Calcutta is still the leading port of India. It mainly exports jute, raw or manufactured and tea. Mica, coal and pig iron are also exported. Imports include manufactured articles, automobiles, food grains and tinned goods. Industry has developed all around Calcutta, the leading industry

being jute. Other industries are textiles, paper, chemicals, aluminium (rolling and finished goods), glass, shoes, rubber goods, automobiles, iron and steel and matches. The population of Calcutta has nearly doubled since the census in 1941, when it was 21,08,600. Many plans are being studied to develop residential suburbs and provide better transport facilities by constructing a circular electric train round the city.

The hinterland of Calcutta includes the whole of North East India covering West Bengal, Assam, Bihar, Orissa and part of Uttar Pradesh and Madhya Pradesh. It is the leading industrialized area in India including Jamshedpur, Dalmianagar, Asansol and Raniganj. It is also densely populated and contains fertile alluvial plains in the Ganges valley. Communications are fairly well developed in the hinterland.

Bombay: It is the second biggest town and port of India. It has the finest natural harbour of the country, safe from monsoon storms. The harbour lies between the mainland and the island of Bombay. So it is protected by land on all sides except the entrance south of Colaba Point. The storms which brew in the Arabian Sea, specially in the pre-monsoon and post-monsoon intervals, and strike the western coast with great violence and fury do not affect the harbour. The population of Bombay in the 1941 Census was 1,490,000 but now it has surpassed the twenty lakh mark. Like Calcutta, Bombay is served by two railway systems, the Bombay Baroda & Central India Railway and the Great Indian Peninsula Railway. The former has its terminus at the Bombay Central Station, (though a branch proceeds further south to Church Gate station for local service) and the latter at the Victoria Terminus in the heart of the city. Both the lines serve the harbour and a special boat train runs to Ballard Pier, where passengers can shift without trouble into ships. While the B. B. & C. I. serves the northern and north-eastern hinterland including North Bombay, Saurashtra and Rajasthan up to Delhi, the G. I. P. serves the hinterland more eastwards and southwards including Madhya Bharat, Bhopal, western portions of Madhya Pradesh and Hyderabad and Central Bombay. South of Poona some part of the hinterland is served by the M. S. M. Railway. The railways use two gaps in the Western Ghats named as the Thal Ghat and the Bhor Ghat to connect with the hinterland.

Though coal is not found near Bombay, the hydro-electric power developed in the Western Ghats serves the city. Besides providing municipal needs, it provides power to the highly developed cotton industry and the local trains. Bombay exports the products of Western India which include short staple cotton, oil-seeds (linseed, groundnut, castor), hides and skins and textiles. It



Map 53
Situation and communication lines of Bombay.

imports manufactured goods from Europe including machinery, textiles, chemicals, mineral products (mainly oil) automobiles and iron and steel goods. The population of Bombay contains elements like Parsees who have shown a remarkable acumen for business, trade and industry. In this respect Bombay is the leading city in India, and shall remain so in future.

The Bombay harbour is very spacious, being 14 miles long and 5 miles wide, with a depth varying from 22 to 40 feet. There are three enclosed Wet Docks and two Dry Docks. Nearly 14

million tons of cargo are handled every year. The Cotton Depot covering an area of 127 acres is one of the largest in the world. The Grain Depot covers 80 acres, and there are several other depots.

Madras: Though it is the third biggest town and port of India, Madras suffers from the lack of a natural harbour. The sea in this region is shallow with a sandy beach. The harbour is therefore artificially built by constructing two concrete works projecting into the sea and enclosing a space of 200 acres with a depth of about 30 feet. It can accomodate about 14 vessels.

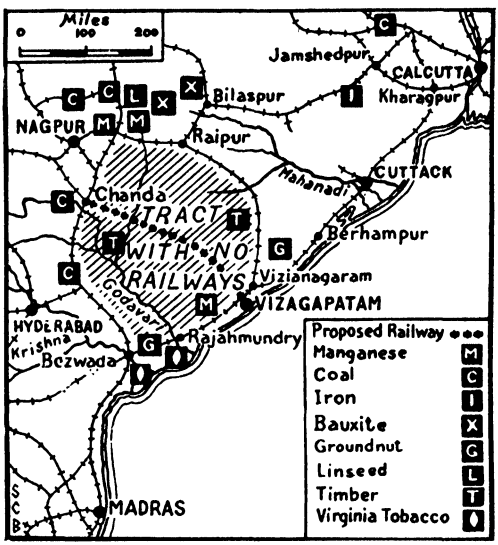
Nearly the whole of the south-eastern portion of the Deccan Plateau covering parts of Madras State, Hyderabad and Mysore form the hinterland of this port.

The port is served by the M. S. M. Railway and the S. I. Railway. The former provides connection with north and east to Waltair, Hyderabad, Bellary and Bangalore. The later connects with south and south-east. A number of small south Indian ports serve as tributary ports to Madras.

Warehouses attached to the port cover 16 acres. Oil from bulk oil steamers is pumped ashore by pipes. The chief imports into Madras are rice, food-grains, coal, oils, manures, paper, timber, tanning material, glass, metal, chemicals, hardware, machinery, automobiles and building material. The chief exports are groundnuts, skins and hides, tobacco, ores, cotton manufactures, manures and coffee.

Vizagapatam (*Vishakhapatnam*): This is a new rising port. It has been declared as a major port and is visited by ocean going steamers. The harbour consists of a deep pool of sea water sheltered by a promontory called the Dolphin's nose. It is connected to the open sea by a deep narrow channel, whose mouth is protected by a break-water, consisting of two sunken ships. The facilities provided at the harbour are capable of further expansion. It is 550 miles south-west of Calcutta and 488 miles north-east of Madras. Its hinterland consists of the northern portion of Madras eastern part of Madhya Pradesh and portions of Orissa and Hyderabad. The hinterland is rich in minerals including iron ores and manganese. But much of it is still covered by forest. It is served by the B. N. Railway and

the M. S. M. Railway. The new connection with Raipur provides a short cut from the fertile Chhattisgarh plain in C. P. producing wheat and linseed, and the manganese belt of Madhya Pradesh. A new line is proposed to be built to Chanda through the forested Bastar hills, so that four lines will serve the port. New ship-building yards built in Vizagapatam have increased its importance greatly. The sea-borne trade of the port is increasing year after



Map 54
Situation and communication links of Vizagapatam.

year. The principal exports are manganese, oil-seeds, oil-cakes, myrobalans and timber. The imports are hardware, machinery, food-grains and chemicals. After the construction of the Raipur-Vizianagaram railway line Vizagapatam has become the chief manganese exporting port of India.

Bimlipatam is a small port only 22 miles north of Vizagapatam. Imports are of little importance, but good amounts of Bimlipatam jute, myrobalans, oil-seeds and ground nuts are exported.

Gopalpur: It is a small port south-east of Chilka Lake. It is more a health resort on the sea side than a port. The foreign

trade consists mainly of cargo brought by transhipment from Madras, Rangoon and Colombo. It is served by the B. N. R.

Cocanada: This port lies to the north of Godavari delta, and is connected by a branch line to Samalkot on the M. S. M. Railway. It has nearly 50 jetties and wharves. The principal exports are groundnuts, castor-seeds and tobacco, and the imports are mineral oil, hardware and metal goods.

Masulipatam: It lies just north of the Krishna delta, south-west of Cocanada. It is connected with the main line of the M. S. M. Railway by a branch line from Bezwada. It exports groundnuts, castor-seeds and oil-cakes.

Pondicherry: It is the capital of French Possessions in India, and is the centre of the export trade in groundnuts from the French territory. It is served by a branch line of S. I. Railway from Villupuram. Other exports are onions, mangoes and bone-meal. The chief imports are arecanuts, foodstuffs, cement, timber, wines cotton and silk piecegoods and chemicals.

Cuddalore: It is 20 miles south of Pondicherry and is served by another branch line from Villupuram. The coasting trade consists of grain and pulses. The import is chiefly of boiled betelnuts from the Straits.

Karikal: It is a French Possession in the Kaveri delta. It has considerable traffic in rice by country boats. It imports betelnuts and mineral oil.

Negapatam: It is 14 miles south of Karikal. It is the terminus of the Trichinopoly-Tanjore branch line of the S. I. Railway. It is the main port of Kaveri Delta and exports rice, groundnuts, tobacco and fresh vegetables.

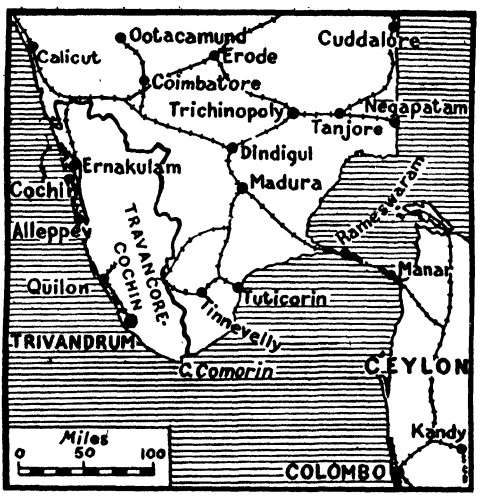
Dhanushkodi: It is the terminus of the South Indian Railway at the south-western tip of Pamban Island jutting towards Ceylon. It carries a very large proportion of traffic between India and Ceylon exporting rice, fish and cotton piece-goods and importing coconuts, coconut oil and tea. Nearly all the passenger traffic with Ceylon is through Dhanuhskodi.

Tuticorin: It is the third largest port of South India and lies about 100 miles south of Madura to which it is connected by the S. I. Railway. Steamers anchor about five miles away from

the shore and continuous dredging is necessary. There is a considerable trade with Ceylon in rice, pulses, onions, chillis, and livestock, senna leaves and cardamoms.

Alleppy: It is the chief port of Travancore 35 miles south of Cochin. Its exports are coconuts, copra, coir fibre and matting, cardamoms, ginger and pepper.

Quilon: This is the second important port of Travancore and is served by the S. I. Railway line which goes from Madras to Travancore via Shencottah gap. Exports are the same as those of Alleppey, which is only fifty miles to the north.



Map 55
South Indian Ports.

Cochin: It is the third most important port of Deccan only exceeded by Madras and Bombay. The railway line from Madras through Pal Ghat Gap approaches it. The backwaters behind it provide an excellent waterway parallel to the coast. The port was much improved during the last war, and was very busy when Madras and Calcutta were practically closed, with the Japanese navy dominating the Bay of Bengal. There has been steady increase in the number of steamers visiting the port. The exports are coconuts, coir fibre, tea, coffee, pepper, cardamoms etc.

Calicut: This port is another 100 miles north of Cochin on the S. I. Railway line going to Mangalore. The sea being shallow, steamers anchor about three miles from shore. There are two piers about 1,200 yards apart and ten wharves along the shore. The principal exports are coir, coir fibre, copra, coffee, tea, pepper, ginger, rubber, groundnuuts and fish manure.

Tellicherry: It is 58 miles north of Calicut on the railway to Mangalore. It can be used even during the monsoon. The main exports are coffee, pepper, copra, tea, ginger, cardamom, sandal-wood and rosewood.

Mangalore: It is one of the four ports on the west coast between Bombay and Cochin, one of which will be chosen for development into a major port, by the West Coast Major Port Development Committee. The other three are Bhatkal, Karwar and Malpe. Kandla has already been chosen as a major port and the new choice will be the second new major port on the west coast. Mangalore is the northwestern terminus of the South Indian Railway and is connected by a surfaced road to Hassan on the Mysore State Railway; the road goes further east to Mysore and Bangalore. It is a tidal port and is also served by backwater communications. At present only small vessels can berth at its wharves. Chief exports are pepper, tea, cashew nuts, coffee, sandal-wood, rubber, tiles and fish manure.

Bhatkal: This port lies in Bombay State nearly 50 miles south of Jog Falls Hydro-electric power station in Mysore State. The railway comes up to Talguppa about twenty miles to the east of Jog Falls. It could be further extended up to Jog Falls and to Bhatkal. The immediate hinterland of the port in Mysore State is already industrialized with steel, paper and cement mills at Bhadravati and a match factory at Shimoga. A further advantage is the ultimate capacity of 120,000 kw. of power to be developed at the Jog Falls. It will prove to be an excellent port for the western part of Mysore State, if developed into a major port.

Karwar: It is further north of Bhatkal. The harbour is in the Kali estuary, which is entirely safe from storms. The railway line to Goa and the declining trade of sandal-wood and spices has gradually lessened the importance of the port.

Malpe is a large fishing centre on the west coast. There is a large tract of waste land nearby suitable for industrial plants or ship-building yards. A long chain of islands known as St. Mary's Isles, running parallel to the coast, can serve as a sea wall. The port has a natural safe harbour free of rocks, sand drifts and currents.

Marmagao: This port lies at the western extremity of the M. S. M. Railway line from Madras via Bellary across the plateau. It is in Portuguese territory. Its exports are groundnuts, cotton, coconuts and manganese.

Surat: Situated on the estuary of river Tapti it was a famous port in the past. The East India Company first established a factory here in India. But all its past glory is now gone. The port is badly silted up. Nearly all its trade has now been transferred to Bombay.

Bhavnagar: It is 125 miles south of Ahmedabad on the Gulf of Cambay in Kathiawar. Goods from large vessels have to be moved in lighters for eight miles to the ware houses. The port is the terminal point of a branch of the Baroda State Railway.

Porbandar: It is another Kathiawar port which has lost her past glory. Now it manufactures cement and exports it, together with building stones.

Port Okha: This is a new rising port of Kathiawar at the north western tip of the peninsula. It is in Baroda State. This position is geometrically not favourable for the port as it cuts out its hinterland to a narrow sector. (The position at the head of a bay is more advantageous, the hinterland sector having a big reflex angle). The harbour scheme has been well designed, and modern in conception. Large ships can approach it at all times, but the approach channel is circuitous and not devoid of risk. A railway line from Ahmedabad reaches this extreme point. It exports oil-seeds and cotton and imports machinery, automobiles and hardware.

Bedi Bandar: It is the port of Navanagar in the Gulf of Kutch. Ships have to anchor miles out in the sea.

Mandvi: This is the port of Kutch, which is now being centrally administered. Refugees from Sind have increased its population, and may lead to its prosperity in future.

Kandla: This port has been recommended for development as a major port to replace the loss of Karachi to India. It lies 30 miles south east of Bhuj on the southern coast of Kutch near the eastern extremity of the Gulf of Kutch. This recommendation of the West Coast Major Port Development Committee has been accepted by the Government of India.

Kandla Creek, situated at the eastern end of the Gulf of Kutch, constitutes a natural sheltered harbour and is easily navigable. It has maintained a depth of water of over 30 ft. since 1851 although a bar has formed at the entrance in recent years. The land on the west bank is only 2 or 3 ft. below high water and presents no serious reclamation problem. The geographical position of Kandla is best suited to replace the port of Karachi in its service to the hinterland. Delhi is 656 miles from Kandla as against 783 miles from Karachi. Similarly Hissar is 688 miles from Kandla as against 733 miles from Karachi. The other advantages of Kandla are:

(1) The deep-water sheltered harbour in close proximity to high land affords quick and economical development into a major port.

(2) Economy of construction and maintenance; low cost of reclamation and comparatively little dredging.

(3) Rail connections with the hinterland will be easily established.

(4) The undeveloped and unexploited nature of the territory of Kutch, covering 1,700 sq. miles of which the two Ranns of Kutch comprise 900 sq. miles. There are great potentialities for the development of industries such as salt, cement, glass and fishing and of minerals like Gypsum, lignite,bauxite, etc.

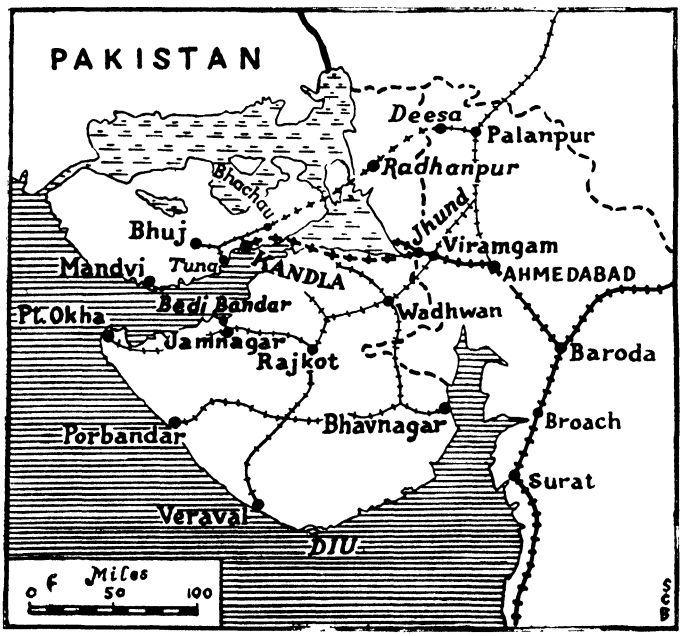
(5) Easy availability of land for the port area.

Kandla could be developed, in the first instance, to handle up to two or three tons of cargo per annum, by the construction of berths facing the creek. The site lends itself to the construction of an impounded dock, if necessary.

There are certain disadvantages of the Kandla site which however, are remediable without much difficulty. They are the bar at the entrance to the creek, non-existence of rail communications and inadequate water supply. With regard to the bar it is held,

that it could be removed by dredging. The water in the creek is only very slightly silt-laden, and the fact that the remainder of the creek has maintained a great depth of water for many years is a further indication that the bar could be removed.

As regards the second defect, the Committee has proposed two rail connections—a broad gauge line from Jhund to Kandla, a distance of 137 miles, and a metre gauge line, 174 miles long connecting Deesa, Radhanpur, Piprala and Kandla. The proposed railway lines will run through vast virgin tracts of territory and will be of considerable strategic importance.



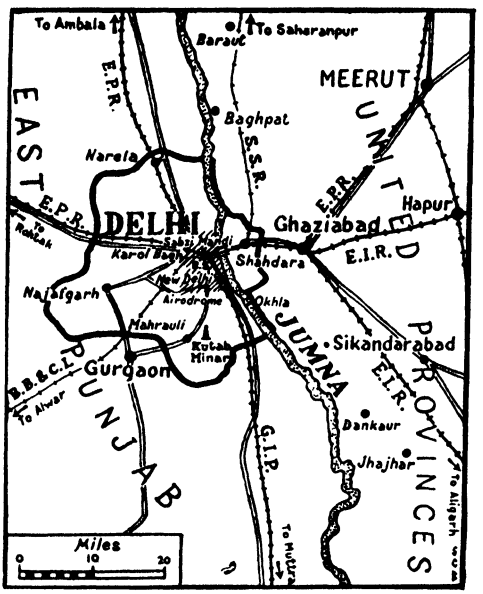
Map 56
Ports of Saurashtra and Kutch, showing the location of Kandla.

With regard to water supply, the opinion is that there are resources for an adequate water supply both to the port and the port town at Kandla.

Work on Kandla port has already started. A railway link survey to connect Kandla with Ahmedabad is now in progress.

Inland Towns and Trade Centres

Delhi: This is the capital of India, and was so for a very long time in the past. It cannot now boast of the central position it occupied in undivided India, and perhaps Jubbulpore is more centrally situated now. But it still occupies a strategic situation lying astride the watershed between the Indus Valley and the Gangetic Valley, and the Himalayan Mountain Wall and the great Rajasthan desert. It has developed as a great route centre and



Map 57
Delhi and its communications.

roads and railways converge upon it as spokes of a wheel. The Grand Trunk Road from Calcutta to the north-western frontier of India passes through it. Six broad gauge, one metre gauge and one narrow gauge railway lines converge on it, four of them joining to the east of Jamuna. Through and mail trains on them run to (1) Kanpur and Calcutta, (2) Moradabad and Dehradun, (3) Meerut and Amritsar, (4) Panipat, Kalka and Simla, (5) Rohtak, Bhatinda and Ferozepore, (6) Agra and Bombay, (7) Alwar, Jaipur and Ahmedabad and (8) Saharanpur. Naturally

therefore, Delhi has developed as a great inland trade centre. Its population in 1941 was 5,22,000. Now it is nearly eight lakhs, specially because of the influx of refugees from West Punjab. Plans have been formulated to build suburban towns around Delhi to accomodate them. Delhi has a number of industrial units including a textile mill and chemical factories. There are also flour mills, sugar mills, biscuit making factories and vegetable ghee factories, some being in the neighbourhood. Delhi is famous for her handicrafts of silver and gold thread, silver and gold leaf, embroidery and ivory work.

Towns of East Punjab.

Amritsar: It is famous for the Golden Temple, the well known Sikh shrine, but is also important as a grain market and cotton and woollen piecegoods trade centre. Its carpet and shawl industry is well known. Its importance has now increased as a strategic border town, being the last important town on the East Punjab Railway, and on the route to Kashmir. All the trade with Kashmir now passes through Amritsar. From here the broad gauge line extends to *Pathankot,* from where the new road to Kashmir starts.

Jullundur: It is an important grain market and cantonment. It is the present capital of East Punjab.

Ludhiana: It is 23 miles south of Jullundur on the main East Punjab Railway line. It is famous for its silk, cotton and woollen textiles and hosiery. Turbans of Ludhiana are famous.

Simla is the summer capital of East Punjab, India and the newly made Himachal Pradesh. It is a health resort 7,000 feet above sea level in the Himalayas.

Chandigarh: A few miles north of Ambala, this site has been chosen to construct the new capital of East Punjab. It will be a residential garden city on an American model.

Towns of Uttar Pradesh.

Moradabad: It is 100 miles East of Delhi on the E. I. Railway, and an important railway junction. It is famous for its brassware, enamel industry and cutlery. It exports mangoes in large quantities.

Bareilly is an important market for timber and forest products.

Nainital, Almora and *Mussoorie* are famous hill stations in the Himalayas.

Hardwar is a great religious centre, on the gap made in Siwalik Ranges by the Ganges. From here the Upper Ganges canal is taken out.

Aligarh is famous for its locks, scissors and knives. It is important for dairy industry and exports butter and ghee. The Aligarh Muslim University is situated here.

Agra is famous for many articles of art, specially stone-ware. It exports red sandstone slabs and toys made of marble and soapstone. Dayalbagh near Agra manufactures shoes, carpets and brass utensils. It is situated on the west bank of Jamuna with the world famed Taj Mahal standing on the same bank, and attracting tourists from all over the world.

Kanpur is a purely industrial town and hums with industrial activity. It has cotton textile, woollen textile and sugar mills. It is famous for its leather, leather goods and shoes. It has a very large ordnance depot. Tents are manufactured here. It is a big railway junction. It is on the Ganges.

Lucknow is the seat of the State Government and a university town. It is known for its art goods which include silver, gold and ivory works, wood carving, pottery and perfumes. It is also a market for agricultural produce.

Allahabad is also a university town and a sacred place, being on the confluence of the Ganges and Jamuna. It has many small industries based on the agricultural produce of the surrounding country side, namely oil, sugar and flour mills. It also exports guavas and mangoes. It is a very important railway junction and air-port. New industries including a paper and a rayon factory will be established in its suburbs. An agricultural and a cattle breeding farm has been developed in an eastern suburb.

Mirzapur is 45 miles east of Allahabad. It is famous for its carpets, knives, pottery and stoneware. It has a considerable brass industry for manufacturing utensils. It is on the main E. I. Railway line.

Banaras is the biggest centre of pilgrimage for Hindus on the Ganges. But it is also a great trade centre for grains and oil-seeds. It has several oil, flour and sugar mills. It is also famous for its silks and brocades. Wooden toys, glass and metal goods are also made here. It is the seat of the Banaras Hindu University. Like Allahabad it exports mangoes and guavas..

Ferozabad is a small town east of Agra. It is a great centre of glass-bangle making industry. Glass slabs are imported for the production of bangles.

Gorakhpur in the north-eastern part of U. P. is a big centre for timber and sugar mill industry.

Towns of Bihar.

Patna on the river Ganges is the State capital. It manufactures sugar and electric bulbs. It is an important trading centre for the produce of the surrounding villages, one important export being chillies. It is a university town.

Gaya is a religious centre on river Phalgu and produces brass-ware, carpets and blankets.

Ranchi and *Hazaribagh* are important hill stations situated 2,000 feet above the sea level. Hazaribagh has a sisal plantation, which is maintained by jail convicts who make carpets, mats etc from the fibre. Ranchi has a sericulture station and an establishment for lac research.

Kodarma is a mica mining centre, while *Giridih* is known for mica splitting and mica trade.

Dalmianagar and *Jamshedpur* are two leading industrial towns of Bihar (See Chap. XII).

Jharia, Dhanbad, Gomoh and *Bermo* are coal mining certres.

Towns of West Bengal.

Darjeeling, Kurseong and *Kalimpong* are Himalayan hill stations. The first one is the summer capital of the State and a tea producing centre. But much more tea is produced around Kurseong. Oranges and pineapples are produced in the valleys and exported in large quantities. Kalimpong is on the overland trade route from Tibet and is a big centre for wool trade. Woollen goods are also manufactured here including

carpets and shawls. Soft wood timber is also exported from these towns.

Siliguri: It is important for the trade and export of timber, tea, oranges and pineapples. It is now an important town on the Assam rail-link.

Murshidabad is a silk and cotton textile centre. It also exports mangoes.

Burdwan and *Birbhum* are district towns and both export paddy and rice. Rice mills are abundant in both of them.

Serampur is only 12 miles north of Calcutta on the Hooghly. It has many jute mills and a paper mill nearby.

Raniganj is a coal mining centre. It has a paper mill and pottery works nearby.

Asansol is a rising industrial town and coal mining centre. It has iron and steel, aluminium and pottery works in its neighbourhood.

Chittaranjan is the new town built around the Government locomotive factory under construction.

Bankura is famous for silk and cotton handloom industry.

Contai is a town on the sea side. It has a shark liver oil factory. Salt is produced by indigenous methods. A new salt factory will be established nearby.

Diamond Harbour is a port on the mouth of Hooghly 44 miles south of Calcutta. Its importance has declined by the development of Calcutta. It collects and supplies fish to the Calcutta area. If the Kidderpore-Diamond Harbour ship-canal is constructed, its importance will increase.

Towns of Assam.

Shillong is the capital of Assam and an attractive hill station. It is 5,000 feet above sea level and is connected by road to Gauhati.

Cherrapunji is at the top of the southern scarp of Khasi Hills and gets nearly 500 inches of rain every year. It has some coal mines. Limestone and oranges are exported from nearby valleys.

Gauhati is the biggest town and trading centre of the Brahamaputra Valley. Goods and passengers are ferried across the river here between Amingaon and Pandu railway terminii. There is steam navigation in the river all along the valley. Tea and timber are two major items of export from here.

Dibrugarh is an important river port and timber export centre in the upper part of the Brahmaputra Valley.

Silchar is the head of navigation in Surma Valley. It is an important market for tea, timber and Manipur ponies.

Towns of Orissa.

Cuttack is the capital of the State. It is situated on the head of the Mahanadi Delta, where the main line of the B. N. Railway crosses the river. The national highway between Calcutta and Madras will pass here over two new bridges, being built on two distributaries of Mahanadi. It will be industrialized when power is available from the Mahanadi Project. At present it manufactures lac bangles and toys, and has an important timber trade.

Bhubaneshwar is a religious centre and a new air port. The new capital of Orissa is being built here.

Puri is a famous religious centre and a sea resort. It manufactures brass utensils and silver and gold ornaments.

Sambalpur is situated on the Mahanadi where the Hirakud Dam will be built. It is served by a branch line of the B. N. R. from the Calcutta-Nagpur line. It has some textile industry and timber trade now, but with the completion of the Hirakud Project it will become a big industrial centre.

Towns of Rajasthan and *Madhya Bharat.*

Jaipur: It is well known for its art products—pottery, brassware embroidery and stoneware. It has mica mines nearby.

Ajmer is a religious centre for Hindus as well as Muslims. There are mica mines near this town also. Caps and jackets of camel hair are made here. It is centrally administered.

Indore is a large trading centre of Madhya Bharat. It has cotton mills, flour mills and brass and metal works.

Udaipur is important for its market for the agricultural produce of the surrounding country side. It is situated amidst a number of lakes and hills. It has a good tourist trade.

Jodhpur is a fortress town in the desert. It has a modern airport. It is important for salt trade, and textile mills.

Gwalior is an important railway junction and an industrial centre for textiles and pottery. It has also a cigarette factory. It has an important stone quarrying and carving industry.

Towns of Madhya Pradesh.

Nagpur is the State capital. Besides cotton textile mills, it has glass and pottery works. It is a university town and has a technological institute. It exports oranges and manganese. It is a big railway junction and an airport.

Jubbulpore is an industrial town with a textile mill, pottery works, railway workshop and central gun carriage factory. It has marble and soapstone quarries nearby.

Katni is a rising industrial town. It has cement works. Jubbulpore and Katni are served by the G. I. P. railway line between Allahabad and Itarsi.

Raipur is a market for wheat and linseed grown in the surrounding country side. Manganese ore of M. P. passes throngh it to Vizagapatam.

Amraoti, Akola and *Yeotmal* are important for cotton trade and have ginning mills.

Towns of Bombay.

Sholapur on the Bombay-Madras railway line is an important cotton textile centre.

Ahmedabad is the second most important cotton textile centre of India with more than a hundred mills. It is served by the B. B. & C. I. Railway and the Kathiawar ports.

Nasik is an important religious centre near the source of Godavari. It is noted for brass and copper vessels.

Poona is situated 1,850 feet above sea level in the Bhor Ghat gap in Western Ghats, through which the railway line to Madras passes. It is the centre of Maharatta culture. Economically it is not important, and only an annex of Bombay port, with which it is connected by an electric train. It has the biggest meteorological station in India. The National Chemical Laboratory started working here in 1950.

Mahabaleshwar is a hill station in the Western Ghats, 4,500 feet above sea level, near the cource of river Krishna. It is famous for the magnificent views of the canyon of Savitri, cut into trap rocks.

Towns of Madras.

Trichinopoly: It is the head quarters of the S. I. R. It has cotton textile mills, cigar manufacturing and rice trade. Pilgrims visit the rock temple on the Kaveri in large numbers.

Madura is a famous religious town of the south with some of the most gorgeous temples of South India. Thousands of pilgrims visit it every year. It is also a cotton textile centre of some note.

Salem was famous for its steel industry in the past. Metallurgical industry will develop here again in near future, depending on iron ore, magnesium and lignite (brown coal) deposits found in the neighbourhood. Power will be supplied by the hydro-electric grid of South India which is being gradually developed.

Coimbatore is a rising industrial town, and the biggest cotton textile centre of the south. It has a sugarcane research station and is a centre of cotton and arecanut trade. Its great advantage is the supply of cheap electric power from Pykara hydro-electric station, which is being stepped up by the construction of Moyar station.

Ootacamund is an attractive hill station in Nilgiri Hills, 7,000 feet above sea level.

Towns of Deccan Plateau States.

Hyderabad is the capital of Hyderabad State. It is an important centre of cotton trade. Its population in 1941 was 7,39,000 when it was the fourth biggest town of India.

Bangalore in the Mysore State is a leading industrial town of India. It has cotton and silk textile mills, oil mills, chemical works and soap factories, potteries and an electric bulb manufacturing factory. The new industries include manufacture of aircraft and rolling stock. It has a technological institute and an agriculture and dairy research station. Served by the M. S. M.

and M. S. Railways and having an equable climate, it has a great future. It gets supplies of cheap hydro-electric power from Sivasamudram, Shimsha and Jog Falls.

Mysore is important for its heavy chemical industry, sandal-wood oil, silk, ivory and sandal-wood carving. It is the capital of Mysore State.

Bhadravati is an industrial town in the north-western part of the state. It is served by the State railway. It has iron and steel, paper and cement works. With the development of hydro-electric power at Jog Falls its industries will flourish. There is a match factory in *Shimoga,* a neighbouring town.

Towns of Kashmir.

Srinagar is the capital of Kashmir. It is a famous beauty spot of India in the centre of the vale of Kashmir. It has a big tourist trade. It is well known for its shawls, blankets (namda), tweeds (pattu), silk, walnut wood carving and trade in fruits, almonds and walnuts.

Jammu is the winter capital of Kashmir and on the approach road to Srinagar. It is a grain market. It has a large number of temples.

Leh is on the trade route to Sinkiang and Tibet. It is situated 11,000 feet above sea level in the upper Indus valley.

Gilgit is a junction of trade routes in the north-west of Kashmir. Routes from here go to the N. W. F. P., Afghanistan and the Pamirs.

CHAPTER XIV

FOREIGN TRADE

The basis of foreign trade of India under the British rule was mainly an exchange of food and raw materials with manufactured goods between her and the United Kingdom. This basis has changed considerably by the impact of war, and is bound to change further, for India has now attained independence.

In the pre-war period there was a great trade boom. The countries preparing for war, specially Germany, Italy and Japan made huge purchases of food, raw materials and strategic minerals, such as mica and manganese to build up their stock piles. Japan even imported pig and scrap iron from India till she entered the war. The boom continued with an increasing intensity untill submarine warfare substantially diminished all foreign trade, except that wanted for the execution of war. With the Japanese sweeping down to Java and Andamans, it nearly stopped.

In the post-war period there have been some remarkable changes. Another trade boom occurred, resulting from rehabilitation and reconstruction of trade and industry damaged by war. There were slight signs of the coming of a trade slump, but this has been partly offset by the spectre of a third World War, the tension being much accentuated by war breaking out in Korea in July, 1950 and entry of the Chinese from Manchuria to help the North Koreans in November of the same year.

Throughout the post-war period there has been a shortage of dollars and a plenty of pounds, which forced India to have more trade with Britain and less with the U. S. A. Some relief in dollar exchange position was obtained after the devaluation of the rupee by India, but it is still forcing the Government to maintain a rigid control over imports from dollar areas. Britain, Germany and Japan are slowly reconstructing their war shattered

industries and exporting machinery and manufactured goods in ever increasing quantities to India, yet they are not able to supply her needs fully.

Britain having purchased on credit huge quantities of war materials and services during the last war, continues to be a debtor of India, the debt being in the form of sterling balances, which are, however, gradually dwindling.

The partition of India has also materially affected foreign trade. Lastly India now finds herself as a regular importer of food articles. Her plans for self-sufficiency in food are being sorely tested by natural calamities like heavy rains and floods in North Bengal, Bihar, Uttar Pradesh, Saurashtra, Punjab and Kashmir, earthquake and floods in Assam and drought in October, 1950 in Bihar.

The following table gives the imports and exports of India of certain commodity groups for the year preceding the war and two post-war years in lakhs of rupees *

Imports

	1938-39	*1947-48*	*1948-49*
Grain, pulse and flour	13,76	23,00	66,51
Oils—vegetable, animal and mineral	15,62	36,97	37,66
Cotton, raw and waste	8,51	31,20	64,23
Wool, raw	62	2,44	3,17
Chemicals, drugs and medicines	5,62	20,04	28,89
Vehicles	6,68	26,64	32,68
Metals	10,81	23,03	32,97
Dyes and colours	4,03	18,04	15,66
Machinery	19,72	59,14	80,87
Cotton yarns and manufactures	14,15	9,51	17,06

* Report on Currency and Finance for the year 1948-49. (Bombay)

Exports

	1938-39	*1947-48*	*1948-49*
Grain, pulse and flour	7,81	13	7
Tea	23,29	54,90	63,71
Oils—vegetable, mineral and animal	1,06	12,40	11,37
Seeds	15,10	9,80	7,21
Cotton, raw and waste	24,82	39,87	19,15
Jute	13,40	25,83	23,89
Hides and skins—raw, tanned, dressed and leather	11,32	21,98	18,29
Metals	3,46	1,85	3,32
Cotton yarns and manufactures	7,57	20,53	41,13
Jute manufactures	26,26	127.82	146,31

The following table gives the pre-war and post-war composition of trade under three main heads:—

	1938-39		*1948-49*	
	Rs. Crores	*Percentage*	*Rs. Crores*	*Percentage*
Imports				
Food	24.00	15.8	91.98	17.8
Raw materials	33.18	21.8	126.93	24.5
Manufactured articles	92.75	60.9	294.52	56.9
TOTAL	149.93	98.5	513.43	99.2
Exports				
Food	39.43	23.3	87.55	20.7
Raw materials	76.28	45.1	98.64	23.3
Manufactured articles	50.72	30.0	234.79	55.5
TOTAL	166.43	98.4	420.98	99.5

The following table* gives India's foreign trade in greater detail for the year 1949-50 (April-March), in lakhs of rupees:—

	Classes	*Imports*	*Exports*
I	*Food, drink and tobacco*		
	A. Fish	20	1,86
	B. Fruits and Vegetables	6,69	7,53
	C. Grain, Pulse and Flour	99,55	4
	D. Liquors	1,08	2
	E. Provisions and Stores	7,69	76
	F. Spices	3,54	18,19
	G. Sugar	—	43
	H. Tea	1	72,06
	I. Other Food and Drink	1,37	1,08
	J. Tobacco	2,23	12,48
	Total—Class I	1,22,36	1,14,44
II	*Raw materials*		
	A. Coal	1	4,03
	B. Other non-metallic minerals	2,71	7,17
	C. Fodder and Bran	38	—
	D. Gums, Resins and Lac	1,29	8,93
	E. Hides and Skins raw	34	6,81
	F. Metallic ores and Scrap Iron	21	6,39
	G. Oils-Vegetable, Animal and Mineral	59,19	8,05
	H. Oil-Cakes	1	6
	I. Paper-making materials	64	38
	J. Rubber, crude	17	—
	K. Seeds and Nuts	1,94	14,88
	L. Tallow, Stearing and Wax	53	4
	M. Cotton, raw and waste	63,26	19,34
	N. Jute „ „	3	22,28
	O. Silk „ „	21	5
	P. Wool „ „	3,03	4,30
	Q. Other Textile Materials	50	1,65
	R. Wood and timber	2,83	58
	S. Miscellaneous	7,02	4,14
	Total—Class II	1,44,30	1,09,08

* Supplement to Indian Trade Journal, August 17, 1950.

III	*Articles mainly manufactured*		
	A. Apparel	45	94
	B. Arms, Ammunitions and Military Stores	1,25	2.5
	C. Chemicals, Drugs and Medicines	16,13	2,08
	D. Cutlery, Hardware and Implements	15,82	1,48
	E. Dyes and Colours	11,11	1,90
	F. Electrical goods and Apparatus	13,02	4
	G. Furniture and Cabinetware	33	16
	H. Glassware and Pottery	2,51	13
	I. Hides and Skins tanned and Leather	72	18,40
	J. Machinery	1,05,52	51
	K. Metals-Iron and Steel and Manufactures thereof	13,70	1,57
	L. Metals-other than Iron and Steel and Manufactures thereof	18,16	79
	M. Paper, Pasteboard and Sationery	9,71	24
	N. Rubber Manufactures	31	1,02
	O. Vehicles	23,46	76
	P. Cotton, Yarns and Manufactures	18,41	72,66
	Q. Jute ,, ,, ...	5	1,27,59
	R. Silk ,, ,, ...	32	28
	S. Woollen ,, ,, ...	5,98	3,74
	T. Other Yarns and Textile Fabrics	16,05	2,52
	U. Miscellaneous	15,57	11,00
	Total—Class III	2,88,58	2,47,85
IV	*Living Animals*	12	31
V	*Postal Articles and baggage*	4,68	1,83
	GRAND TOTAL	5,60,02	4,73,52

The tables show that the total value of trade in 1949-50 rose slightly above the previous year. The imports rose to 560.02 crores of rupees as compared to 518 crores in the previous year, and exports to 473.52 crores as compared to 4422.8 crores.

The tendency of the rise in import of food and raw materials, and fall in the import of manufactured goods contniued. In the export trade food (mainly tea) showed a rise, raw materials kept constant, while the manufactured articles registered a fall. The following table gives the percentages of imports and exports of the three classes for the pre-war and the last two years:—

Imports	*Food*	*Raw Materials*	*Manuf. Goods*
1938-39	15.8	21.8	60.9
1948-49	17.8	24.5	56.9
1949-50	22.0	26.0	52.0
Exports			
1938-39	23.3	45.1	30.0
1948-49	20.7	23.3	55.5
1949-50	24.3	23.1	52.6

Direction of Foreign Trade

Trade with various countries for 1948-49 and 1949-50 in lakhs of rupees is given below:—

Country	*1948-49*		*1949-50*	
	Imp.	*Exp.*	*Imp.*	*Exp.*
A. Sterling Area				
United Kingdom	1,52,36	98,28	1,49,32	1,13,89
Pakistan	22,37	46,30	12,45	15,61
Australia	22,57	20,64	33,98	26,21
Burma	19,25	10,56	12,86	14,21
Ceylon	2,61	12,31	2,75	16,02
Kenya	10,80	3,61	15,04	6,08
Malaya	9,89	5,34	13,64	17,27
Iraq	1,27	1,39	3,38	3,98
New Zealand	96	2,77	1,44	3,19
Irish Republic	—	4,23	2	3,51
Kuwait	5	2,27	11	2,84
Bahrein Is.	4,76	86	6,26	1,11
Aden	1,77	2,00	1,46	7,04
Nigeria	—	2,41	17	3,98
Tanganyika	1,84	1,48	2,70	2,35
Mauritius	—	1,11	—	1,51

Country	1948-49 Imp.	1948-49 Exp.	1949-50 Imp.	1949-50 Exp.
B. Dollar Area				
U. S. A.	1,06,73	70,68	87,92	79,36
Canada	8,44	8,39	12,09	10,87
Cuba	66	4,97	—	5,66
Philippines	68	1,99	68	1,45
C. Other Hard Currency Area				
Argentina	7,33	16,96	8,78	7,78
Japan —	6,37	4,59	21,41	6,13
Switzerland	8,65	1,22	7,54	2,51
Belgium	7,15	5,89	4,82	8,99
W. Germany	2,25	2,61	5,80	9,13
D. Medium Currency Area				
Portugal and her Colonies	2,83	2,33	2,99	1,18
E. Other Area				
France	2,92	7,35	3,80	5,26
Netherlands	5,46	7,25	4,83	7,05
Italy	18,28	6,55	13,95	5,38
Czechoslovakia	2,09	2,19	2,80	1,41
Egypt	31,90	6,72	39,46	7,92
China	1,20	5,69	51	2,44
Indonesia	25	1,53	2,08	1,30
Iran	20,46	3,14	32,48	4,82
Afghanistan	2	1,90	34	1,95
Brazil	3,00	2,60	54	38
Peru.	1,11	1,59	2,79	1,24
Chile	1,37	1,73	44	2,26
U. S. S. R.	3,25	5,37	12,63	3,53
Sweden	6,08	2,12	5,92	2,26
Norway	4,35	86	2,43	1,06
Denmark	1,42	1,64	1,41	2,42

United Kingdom leads all others as the leading exporter to and importer from India. The U. S. A. comes second. Egypt is the third supplier of goods to India, while Australia is her third best customer. The following list gives the ten top countries

from and to which India imported and exported goods in 1949-50, figures against them showing trade in lakhs of rupees.

Imported from		*Exported to*	
1. United Kingdom	1,49,32	1. United Kingdom	1,13,89
2. U. S. A.	87,92	2. U. S. A.	79,36
3. Egypt	39,46	3. Australia	26,21
4. Australia	33,98	4. Malaya	17,27
5. Iran	32,48	5. Ceylon	16,02
6. Japan	21,41	6. Pakistan	15,61
7. Kenya	15,04	7. Burma	14,21
8. Italy	13,95	8. Canada	10,87
9. Malaya	13,64	9. W. Germany	9,13
10. Burma	12,86	10. Belgium	8,99

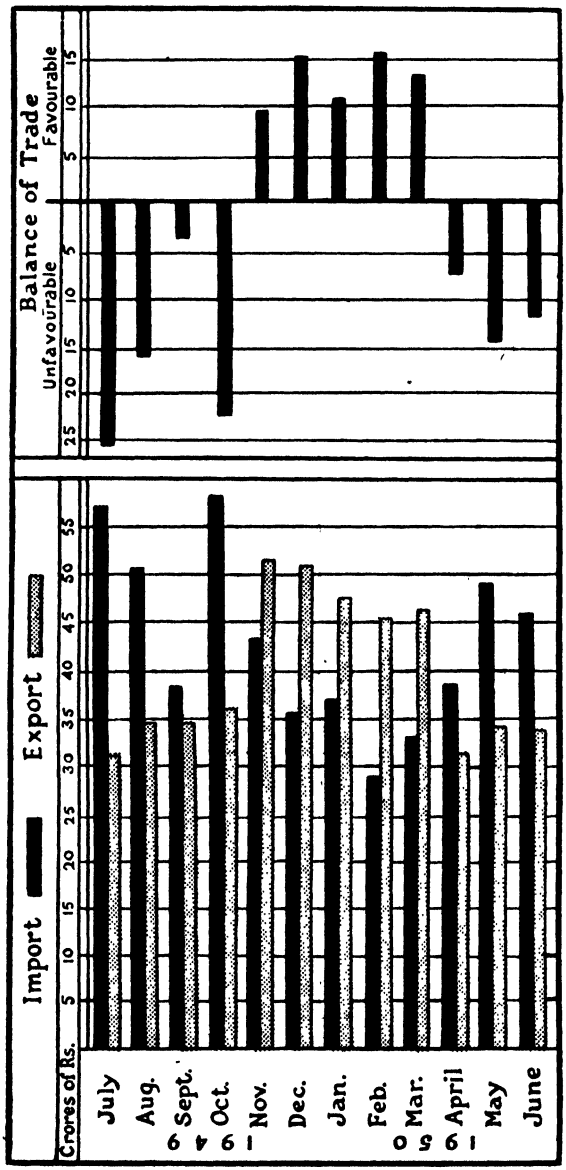
The main changes in the direction of the foreign trade of India have been the rise in her trade with U. S. A., and Australia and her role as a supplier of manufactured goods to the smaller near and middle east countries. From Iran she is buying an ever increasing quantity of mineral oil. Her trade with Japan has risen suddenly, while that with China has fallen. With the establishment of deplomatic relations with the latter, it is hoped that trade will be revived in this direction. Trade with Pakistan showed a big fall. She was the third most important customer of India in 1948-49, being sixth in 1949-50. Among suppliers Pakistan was fourth in 1948-49 and only twelfth in 1949-50. After devaluation India's export trade showed a distinct rise, specially with the dollar and hard currency areas.

Balance of Trade

A discouraging feature of India's foreign trade in recent years has been her increasing unfavourable balance of trade, specially with dollar areas. To stop this tendency India devaluated the rupee in September 1949 and since then had some success. Her total imports, exports and balance of trade in crores of rupees for some years are given below :—

	Import	*Export*	*Balance*
1938-39	155	169	+ 14
1947-48	446	408	− 38
1948-49	527	423	−104
1949-50	560	474	− 86

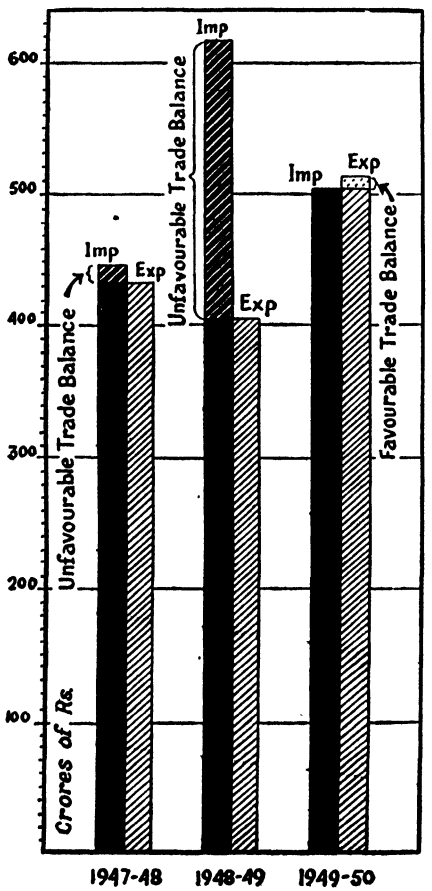
Recent trends in the balance of trade are shown month by month in figure 58. After devaluation in September 1949, India



Map 58
India's balance of trade month by month in 1949-50.

had a favourable balance of trade for five months from November 1949 to March 1950. She again had an unfavourable balance of trade for the next three months.

Figures of India's seaborne trade during the post-devaluation year—Oct. 1949 to Sept. 1950—showed a favourable balance of Rs. 8.3 crores against the adverse balance of Rs. 213.8 crores during 1948-49.



Map 59
India's balance of trade for three years (Oct. to Sept.)

The following are the details:—

	1948-49 *crores*	*1949-50* *crores*
Imports	.... 617.6	504.2
Exports	.... 403.8	512.5

While India's exports rose by Rs. 108.6 crores during the post-devaluation year, imports came down by Rs. 113.4 crores.

The average value of exports per month during the post-devaluation period was Rs. 42.71 crores against Rs. 33.65 crores in the previous year.

The encouragement to exports is partly attributable to devaluation and partly to increased business activity all round as compared with the preceding year when, in the closing months, there was a slight recession in the U. S. A. which affected world markets. Other contributory causes were the backlog of orders which came in immediately after devaluation and which were supplied from stocks and the liberalization of imports by many foreign countries.

The reduction in imports into India was mainly due to import restrictions and a substantial drop in the import of foodgrains.

Import, export and balance of trade in crores of rupees for the two years 1948-49 and 1949-50 for countries grouped according to currency areas are given below :—*

Country Group	*Year*	*Import*	*Export*	*Balance*
A. Sterling Areas	1948-49	256	224	—32
„ „	1949-50	262	262	nil
B. Dollar Areas	1948-49	117	89	—28
„ „	1949-50	101	101	—1
C. Other Hard Currency Areas	1948-49	32	32	nil
„ „	1949-50	49	35	—14
D. Medium Currency Areas	1948-49	3	2	—1
„ „	1949-50	3	1	—2
E. Other Areas	1948-49	119	75	—44
„ „	1949-50	146	75	—71

* Supplement to the Indian Trade Journal, August 17, 1950.

Sources of Imported Commodities

Sources of ten leading commodity groups imported by India are given below :—

(1) *Machinery.* This is the most important commodity topping the list of imports. India paid 1,05,52 lakhs of rupees for buying machinery from abroad in 1949-50, which came mainly from the following countries, figures giving the value in lakhs of rupees.

(a) United Kingdom	 60,80	(d) Canada	 4,21
(b) U. S. A.	 25,04	(e) W. Germany	 1,33
(c) Japan	 6,07	(f) Belgium	 1,08

(2) *Grain, Pulse and Flour.* This group is the second in import list, costing India Rs. 99,55 lakhs in 1949-50. The main suppliers were :—

(a) Australia	 27,36	(f) Argentina	 8,71
(b) U. S. A.	 15,97	(g) Egypt	 4,78
(c) Burma	 10,38	(h) Pakistan	.. . 3,62
(d) U. S. S. R.	 10,14	(i) Canada	 3,00
(e) Thailand	 9,86	(j) Italy	 78

(3) *Cotton, raw and waste* is the third leading import commodity group, for which India spent Rs. 63,26 lakh in 1949-50. The suppliers were (lakhs of rupees) :—

(a) Egypt	 34,06	(c) Pakistan	 6,43
(b) Kenya	 13,74	(d) U. S. A.	 1,53

(4) *Oil—Mineral, Vegetable and Animal.* In this fourth leading import commodity group, mineral oil has the lion's share. Coconut and palm oil are also important. Total import in 1949-50 was Rs. 59,19 lakhs, which was supplied by the following countries :—

(a) Iran	 30,98	(d) Bahrein Is.	 6,25
(b) U. S. A.	 8,58	(e) United Kingdom	 1,29
(c) Singapore	 6,29	(f) Ceylon	 67

(5) *Textiles* costing India Rs. 40,81 lakhs in 1949-50 are the fifth commodity group. They were supplied by:—

(a) United Kingdom 1760
(b) Japan 10,73
(c) Italy 9,15
(d) U. S. A. 14

(6) *Metals and manufactures* are the sixth leading commodity group in imports. India had to pay Rs. 31,86 lakh for them in 1949-50. She bought them from:—

(a) U. S. A. 11,39
(b) United Kingdom 9,03
(c) Belgium 2,04
(d) Canada 1,59
(e) Singapore 154
(f) Japan 78
(g) Australia 70

(7) *Vehicles.* Their total import in 1949-50 was Rs. 23,46 lakhs, coming from:—

(a) United Kingdom 13,21
(b) U. S. A. 7,36
(c) Canada 121
(d) Australia 35

(8) *Chemicals, Drugs and Medicines* cost India Rs. 16,13 lakh in 1949-50. They were supplied by:—

(a) United Kingdom 7,81
(b) U. S. A. 4,92
(c) Canada 22

(9) *Cutlery and Hardware* imports in 1949-50 were Rs. 15,82 lakh, which came from:—

(a) United Kingdom 7,22
(b) U. S. A. 315
(c) W. Germany 92
(d) Japan 69
(e) Hongkong 24
(f) Canada 11

(10) *Electrical Goods and Apparatus* form the tenth import commodity group, valuing Rs. 13,02 lakh in 1949-50. They came from:—

(a) United Kingdom 854
(b) Hongkong 156
(3) U. S. A. 126
(d) Canada 33

Destination of Exported Commodities

Customers of ten leading export commodities of India are given in what follows:—

(1) *Jute, raw and manufactured.* This commodity forms, by far, the most important item in Indian export. In 1949-50 jute goods exported were worth Rs. 1,49,87 lakh. Chief buyers of Indian jute are the U. S. A., Britain and Australia. The following table gives the export of jute to various countries in lakhs of rupees in 1949-50:—

(a) U. S. A.	 36,11	(h) Belgium	 4,21
(b) United Kingdom	 16,55	(i) Canada	 3,82
(c) Australia	 14,80	(j) W. Germany	 3,04
(d) Argentina	 7,42	(k) Pakistan	 2,65
(e) Egypt	 5,05	(l) Thailand	 2,25
(f) Hongkong	 4,89	(m) Kenya	 1,39
(g) Italy	 4,33	(n) U. S. S. R.	 1,33

(2) *Textiles.* This commodity group now occupies the second place in the exports of India. It earned her Rs. 79,20 lakhs in 1949-50, when her customers were:—

(a) Singapore	 953	(e) Burma	 395
(b) Ceylon	 691	(f) Kenya	 374
(c) Hongkong	 679	(g) Australia	 370
(d) United Kingdom	 559	(h) Pakistan	 364

(3) *Tea.* This is the third biggest foreign exchange earner of India, giving her Rs. 72,06 lakhs in 1949-50. Customers of Indian tea in 1949-50, (in lakhs of rupees) are given below:—

(a) United Kingdom	 42,11	(e) Australia	 278
(b) U. S. A.	 6,71	(f) U. S. S. R.	 171
(c) Canada	 4,63	(g) Egypt	 170
(d) Iran	 2,99	(h) W. Germany	 53

(4) *Hides and skins, raw and tanned* forms the fourth most important commodity group in Indian export trade. There

value amounted to Rs. 25,21 lakh in 1949-50. The share of various countries in the same year was:—

(a) United Kingdom	16,34	(d) Australia	35
(b) U. S. A.	3,55	(e) W. Germany	31
(c) Pakistan	79	(f) Belgium	15

(5) *Cotton—raw and waste.* A good amount of this commodity is also exported from India, being Rs. 19,34 lakh in 1949-50. The following were its destinations in the same year:—

(a) Japan	430	(d) United Kingdom	270
(b) U. S. A.	352	(e) W. Germany	121
(c) Belgium	319	(f) Italy	79

(6) *Spices* have been exported from India from times immemorial. Now they occupy the sixth place in her export trade. They earned her Rs. 18,19 lakh in 1949-50, the buyers being:—

(a) U. S. A.	699	(d) Pakistan	66
(b) United Kingdom	341	(e) Canada	61
(c) Ceylon	163	(f) Italy	55

(7) *Seeds and nuts.* India sold Rs. 14,88 lakh worth of seeds and nuts to the following countries in 1949-50:—

(a) United Kingdom	284	(d) Italy	70
(b) W. Germany	164	(e) Japan	62
(c) Australia	122	(f) Canada	54

(8) *Tobacco* earned for India Rs. 12,48 lakh in 1949-50. The following countries were her customers:—

(a) United Kingdom	684	(d) Ceylon	37
(b) Pakistan	267	(e) Singapore	37
(c) Burma	38	(f) Egypt	27

(9) *Lac, gums and resins.* Rs. 8,93 lakh worth of these commodities were sold in 1949-50 to the following countries:—

(a) U. S. A.	349	(c) Italy	35
(b) United Kingdom	254	(d) U. S. S. R.	28

(10) *Vegetable, animal and mineral oil.* Vegetable oil forms the bulk of the three types of oils mentioned. The group earned

Rs. 8,05 lakh in 1949-50, the following countries being the customers:—

(a) Burma	2,57	(d) U. S. A.	33
(b) United Kingdom	1,40	(e) Hongkong	32
(c) Australia	62	(f) Pakistan	24

India-United Kingdom Trade

In the following sections the trade of India with some important countries is given in greater detail. With United Kingdom India has the largest amount of trade. Though U.S.A. is gradually having a larger percentage of trade, United Kingdom is still well ahead of her. Her share of India's total foreign trade in 1949-50 was 25% as compared to 16% of U. S. A. The following table gives the main articles of import of export between India and U. K. in 1949-50 in lakhs of rupees:—

I *Food and drink*	*Import*	*Export*
Tea	—	42,11
Tobacco	11	6,84
Spices	—	3,41
Fruits and Vegetables	—	55
Provisions	115	13
Liquors	64	—
Total—Class I	236	53,22

II *Raw Materials*	*Import*	*Export*
Jute	—	4,64
Seeds and nuts	3	2,84
Cotton raw and waste	1	2,70
Lac, gums and resins	5	2,54
Wool	167	2,03
Hides and skins	—	2,01
Oils—Vegetable, animal and mineral	129	1,40
Metallic ores and scrap	7	1,17
Non-metallic minerals	55	1,11
Total—Class II	488	22,66

III *Manufactured articles*	*Import*	*Export*
Machinery	60,80	8
Vehicles	13,21	8
Cotton manufactures	12,33	3,13
Electrical goods	8,54	—
Chemicals, drugs and medicines	7,81	82
Cutlery and Hardware	7,22	9
Iron and Steel manufactures	5,87	50
Dyes and colours	3,63	58
Other metal manufactures	3,16	5
Paper	2,37	—
Woollen manufactures	2,16	2,40
Glassware	97	—
Arms and ammunitions	90	2
Tanned hides and leather	52	14,34
Jute manufactures	1	11,91
Total—Class III	139,46	37,61
GRAND TOTAL	149,32	113,89

The balance of trade of India with U. K. continues to be unfavourable, though the position improved slightly in 1949-50 as the following figures in lakhs of rupees show:—

1938-39	+ 9,64	1948-49	−54,08
1947-48	−22,58	1949-50	−35,44

India's foreign exchange reserve consists mainly of her sterling assets. But for them, India would not have been able to maintain the unfavourable trade balance for a number of years. These assets showed a sudden fall in 1948-49. They stood at Rs. 1,537 crores at the end of June 1948 and declined to Rs. 820 crores at the end of June 1949, a drop of Rs. 717 crores. To this figure should be added the sterling equivalent of the dollar purchases made during this period from the International Monetary Fund, amounting approximately to Rs. 19 crores, giving a total external payment of Rs. 736 crores.

This heavy outgo of sterling balances was due to (1) the payment to U. K. of Rs. 236 crores for financing the payment of sterling pensions and (2) for the acquisition of installations and stores left behind by them in India after the war; (3) the payment of Rs. 187 crores to the State Bank of Pakistan towards her share of the balances, following the separation of Pakistan currency from that of India. Besides these special payments there was a decline in exports and rise in imports. Strong measures were taken to restrict imports and boost exports. Yet in September 1949 the sterling balances had further fallen to Rs. 776 crores from Rs. 820 crores in June. The devaluation of the rupee in September 1950 had however a stabilizing effect and the balances slightly rose to Rs. 832 crores in January, 1950.*

India, as in the past, continues to export raw materials and food to Britain and import manufactured goods. Among her food exports are tea, tobacco and spices, and among raw materials exported are jute, oil seeds, lac, wool, hides and skins. The leading import from U. K. to India is machinery. Other important import commodities are vehicles, cotton textiles, electrical goods, chemicals and hardware.

India-U. S. A. Trade

U. S. A. is the second most important country in India's foreign trade, her share being 16% in 1949-50. The chief items of *export* in 1949-50, in lakhs of rupees were:—

Jute and Jute manufactures	36,12
Minerals	9,10
Spices	6,99
Tea	6,71
Fruits and vegetables	4,96
Hides, skins and leather	3,55
Cotton, raw and waste	3,52
Lac, gums and resins	3,49
Wool	1,86

* Budget speech of Dr. John Matthai, Feb. 28, 1950.

The chief items of *import* from U. S. A. in the same year in lakhs of rupees were:—

Machinery	25,04
Grain and flour	15,97
Metal manufactures	11,39
Oil,mainly mineral	8,58
Vehicles	7,36
Chemicals and dye stuffs	7,01
Cutlery and hardware	3,15
Tobacco	1,95
Cotton	1,53
Electrical goods	1,26

Total of import and export in the three main categories are given below (in lakhs of rupees):—

		Import	*Export*
I	Food and drinks	18,36	18,45
II	Raw materials	11,11	24,50
III	Manufactured goods	58,01	36,37
	Total	87,92	79,35

India's balance of trade with U. S. A. continued to show a big negative figure until the devaluation of the rupee. It is given in lakhs of rupees for some years below:—

1938-39	+ 4,59	1948-49	−36,05
1947-48	−56,76	1949-50	− 8,56

The improvement in 1949-50 was due to strict controls being imposed on the import of goods from U. S. A., and great efforts for increasing exports to her. After devaluation there was a marked improvement. From Oct. 1949 to June 1950 the average monthly exports to dollar countries rose to Rs. 13.5 crores as against Rs. 9.7 crores for the same period a year ago, or an increase of 40%. Improvement was particularly marked in the export of jute manufactures, cotton, tea, linseed, mica, manganese ore and ground nuts.

India-Australia Trade

Australia is the third most important country in India's foreign trade. Her trade with India has increased greatly in the post-war period.

Main commodities imported by India from her in 1949-50 in lakhs of rupees were:—

Grain and flour	27,36
Provisions and stores	3,50
Wool	75
Metal manufactures	70
Tallow and wax	45
Vehicles	35
Machinery	24

The exports, in the same year, to Australia were:—

Jute and jute manufactures	14,81
Cotton yarns and manufactures	3,59
Tea	2,78
Oil seeds	1,22
Oils mainly vegetable	62
Coal	60
Cotton, raw and waste	59
Hides, skins and leather	31
Lac, gums and resin	20

Figures and balance of trade in lakhs of rupees between India and Australia in the last two years are given below:—

	1948-49	*1949-50*
Imports	 22,57	33,98
Exports	 20,64	26,21
Balance	.... −1,93	−7,77

India-Egypt Trade

With respect to total foreign trade with India, Egypt had the fourth position in 1949-50. An Indo-Egyptian trade agreement envisaged the import of cotton in exchange for various

commodities. The dominating aspect of trade with Egypt is the import of cotton, as the following figures (in lakhs of rupees) for 1949-50 show:—

Imports:	Cotton	....	....	34,02
	Grain and flour	....	....	4,78
	Others	....	....	66
		Total	....	39,46
Exports:	Jute manufactures	..	....	5,00
	Tea.	....	....	1,70
	Cotton textiles	....	....	28
	Spices	....	....	27
	Tobacco	....	....	27
	Others	....	....	40
		Total	....	7,92

So India had an unfavourable balance of trade with Egypt in 1949-50 of 31,54 lakhs of rupees. It was 25,17 lakhs in the previous year.

India-Iran Trade

Iran comes fifth in the list of countries with respect to foreign trade, the most important item being the import of mineral oil. As with Egypt, India had an unfavourable balance of trade with her amounting to Rs. 27,66 lakhs, in 1949-50, and Rs. 17,32 lakhs in 1948-49. The main items of import and export in lakhs of rupees in 1949-50 are given below:—

Imports:	Mineral oil	....	....	30,98
	Other mineral products	....	....	87
	Seeds and nuts	....	....	23
	Fruits and vegetables	....	....	20
		Total	....	32,48

Exports:	Tea	....	....	2,99
	Cotton textiles	....	....	98
	Spices	....	....	30
	Jute manufactures	....	....	19
		Total	....	4,82

India-Malaya Trade

Malaya has proved to be a good market for cotton textiles, similar to Iran. The following figures give the imports and exports to Singapore in 1949-50 in lakhs of rupees:—

Imports:	Vegetable oils	....	....	6,29
	Spices	....	....	2,28
	Tin and wolfram	....	....	1,54
	Sago	....	....	1,03
		Total	....	12,62
Exports:	Cotton textiles	....	....	9,16
	Jute manufactures	....	....	81
	Spices	....	....	31
	Coal	....	....	25

Indo-Pakistan Trade

The division of India in August 1947 was on the basis of communal distribution of population, and so was arbitrary with respect to production. It left each part with a surplus in some commodities, and deficit in others.

Geopraphical conditions are such that some of the commodities will continue to be surplus and deficit as today, but in others the countries will try to become self-sufficient. In minerals India got nearly all the coal and iron, in which Pakistan will continue to be a deficit country. The worst case has been of jute and cotton, the raw materials being produced in Pakistan and the manufacturing industry being located in India. The drive for self-sufficiency has been intensified due to bad relations between the two countries, and it will lead to a gradual fall in trade between the two countries. At present Pakistan can buy from India cotton piece

goods, jute manufactures, sugar, coal, paper and steel. She can export to her raw cotton, jute and wheat.

But the trade between India and Pakistan has been much influenced by strained relations and artificial barriers, the latest being the devaluation of the Indian rupee and the decision of Pakistan not to devalue her rupee. There was a movement in Pakistan for boycotting Indian goods like cotton textiles. She also started buying coal from South Africa and sugar from Cuba. According to the Indo-Pakistan Trade agreement, Pakistan should have purchased 300,000 bales of cloth from India in 1948-49, but she actually bought only 20,000 bales. In the same year India's purchases of raw jute and raw cotton fell far below the agreed target of 5 million bales and 650,000 bales, the actuals being 4.2 million bales and 348,000 bales, respectively. The 1949-50 trade agreement was a bigger failure due to the devaluation muddle, after which trade nearly came to a standstill. Even otherwise, the 1949-50 agreement envisaged a reduced quantum of goods. Thus, India limited its raw jute and raw cotton imports to 4 million bales and 4.5 lakh bales, as against 5 million and 6.5 lakh respectively. Since India has now planned to step up the output of jute and cotton in the coming years, its import from Pakistan will decrease further.

The trade deadlock arising out of devaluation was temporarily removed by a barter trade agreement in April 1950, which provided for the import of 4 m maunds of raw jute from Pakistan and give in exchange cotton and woollen textiles, mustard oil, tobacco and timber. The jute deal was estimated at Rs. 13 crores each way. A trade of miscellaneous commodities worth Rs. 4 crores each way was also decided. Pakistan could buy 50,000 bales of cotton textiles and yarns; 7,000 tons of mustard oil; 5,000 tons of steel; 12,000 tons of timber. 50,000 tons of cement and 5 lakh lbs of tobacco. Free trade was also to be permitted in vegetables, fruits, fish, milk, butter, betel leaves, cotton seeds, soda ash and hides and skins. The agreement expired in September 1950 and was not renewed as no exchange ratio could be agreed upon between Indian and Pakistani currency, and trade came to a stand-still.

Indo-Pakistan trade figures in lakhs of rupees for the last three years are given below:—

	1947-48	*1948-49*	*1949-50*
Imports	1,18	22,37	12,45
Exports	2,43	46,30	15,61
Balance	+1,25	+23,93	+ 3,16

Some important commodities imported and exported in 1949-50 in lakhs of rupees are given below:—

Imports:	Cotton	6,43
	Grain, pulse and flour	3,52
	Oil seeds	63
	Fodder	36
	Fruits and vegetables	28
	Fish	8
	Hides and skins	8
	Chemicals and drugs	8
	Jute	3
Exports:	Cotton textiles	3,04
	Tobacco	2,67
	Jute manufactures	2,65
	Coal	82
	Chemicals and dye stuffs	81
	Leather	79
	Spices	66
	Fruits and vegetables	50
	Iron and steel goods	48
	Micellaneous textile fabrics	46
	Cutlery and hardware	26
	Oils, mainly vegetable	24
	Tea	20
	Rubber manufactures	17
	Paper and stationery	11

Indo-Japanese Trade

India's trade with Japan is partly controlled by a joint agreement between sterling area countries and Japan. The trade has risen considerably in 1949-50, but there has also been a

sharp rise in the adverse balance of trade as the following figures in lakhs of rupees show:—

	1948-49	*1949-50*
Imports	6,37	21,41
Exports	4,59	6,13
Balance	−1,78	−15,28

Efforts are being made to import 15 m lbs of rayon from Japan in 1950-51, under a new agreement. The chief commodities imported and exported in 1949-50 in lakhs of rupees were:—

Imports:	Machinery	6,07
	Rayon	5,32
	Cotton textiles	4,00
	Woollen manufactures	1,40
	Cement	93
	Metal products	78
	Cutlery and hardware	69
	Glass and earthenware	49
	Raw silk	10
Exports:	Cotton, raw and waste	4,30
	Oil seeds	61
	Metal goods	34
	Other minerals	16

Indo-Burmese Trade

India had a favourable balance of trade with Burma of 135 lakhs of rupees in 1949-50, as compared to an adverse balance of 869 lakhs in 1948-49. This was mainly due to a big rise in the export of cotton textiles and jute goods, which together with oil seeds formed the leading items of export. Rice was the main commodity imported, timber being also important. Export, import figures for 1949-50 in lakhs of rupees are given below:—

Imports:	Rice	10,38
	Timber	2,16

Exports:	Cotton textiles	3,75
	Jute goods	3,55
	Vegetable oils	2,57
	Other textiles	74
	Fish	44
	Chemicals and dye stuffs	39
	Metal goods	37
	Coal	36
	Rubber manufactures	27
	Fruits and vegetables	23

India-Canada Trade

Trade with Canada rose from Rs. 17 crores in 1948-49 to Rs. 23 crores in 1949-50, but the favourable balance of Rs. 16 lakhs changed to an adverse balance of Rs. 116 lakhs. The main items of trade in 1949-50 in lakhs of rupees were:—

Imports:	Machinery	4,21
	Grain and flour	3,00
	Metal goods	1,59
	Paper	73
	Electrical goods	33
	Chemicals and dye stuffs	22
	Wood and wood pulp	18
Exports:	Tea	4,63
	Jute goods	3,78
	Spices	61
	Oil seeds	54
	Woollen goods	41
	Lac and gums	15

India-Kenya Trade

With Kenya there was an adverse balance of trade of Rs. 7 crores in 1948-49 and Rs. 9 crores in 1949-50. The chief import is cotton, while the leading exports are cotton and jute manufactures as the following figures show (for 1949-50 in lakhs of rupees):—

Imports:	Cotton	13,74
	Dyes and colours	86

Exports:	Cotton manufactures	....	....	3,74
	Jute manufactures	....	....	1,39
	Tobacco	....	....	12

India-Italy Trade

The pattern of trade with Italy is shown by the following figures in lakhs of rupees for 1949-50:—

Imports:	Textiles of all kinds	....	....	9,15
	Fruits	....	....	98
	Grain and flour	....	....	72
Exports:	Jute, raw and manufactured		....	1,25
	Cotton	....	....	79
	Oil seeds	....	....	69
	Spices	....	....	55
	Lac and gums	....	....	35

Thus cotton, silk, woollen and rayon textiles form the biggest import commodity group, while grains and Mediterranean fruit (grapes and citrus) come next. Jute goods lead in exports.

India-Ceylon Trade

India has a favourable balance of trade with Ceylon, which amounted to Rs. 13 crores in 1949-50, when the trade was as follows (in lakhs of rupees):—

Imports:	Copra and coconut oil	....	....	1,61
	Spices	....	....	32
	Grain and pulse	....	....	21
Exports:	Textiles of all kinds	....	....	6,91
	Spices	....	....	1,63
	Coal	....	....	1,59
	Fish	....	....	1,21
	Fruits	....	....	71
	Sugar	....	....	38
	Tobacco	....	....	37
	Cutlery and hardware	....	....	35
	Oil seeds	....	....	29
	Rubber manufactures	....	....	23
	Jute manufactures	....	....	23

India-Argentina Trade

India signed a barter deal with Argentina to exchange wheat for jute manufactures. The trade in lakhs of rupees in 1949-50 was:—

Import:	Grain and flour	8,71
Export:	Jute manufactures	7,33
	Tea	8
	Lac and gums	7

Indo-Russian Trade

This trade was also governed by a barter agreement for the exchange of Russian wheat for jute, tea and oil seeds. The actual trade in 1949-50 in lakhs of rupees was:—

Imports:	Grain and flour	10,14
	Sulphate of ammonia	2,41
Exports:	Tea	1,71
	Jute	95
	Lac and gums	28

India-W. German Trade

India's trade with this country showed a big increase in 1949-50, when the total trade was Rs. 14 crores, compared to Rs. 5 crores in 1948-49. The favourable balance of trade also rose from Rs. 36 lakhs to Rs. 332 lakhs. Germany like Japan is now a hard currency area. Items of trade in lakhs of rupees for 1949-50 are given below:—

Imports:	Dye stuffs	2,21
	Machinery	1,33
	Cutlery and hardware	92
Exports:	Jute	3,03
	Oil seeds	1,64
	Cotton	1,21
	Coir manufactures	61
	Leather	31

India-Belgium Trade

The pattern of trade with Belgium is given by the following figures for 1949-50 in lakhs of rupees:—

Imports:	Metal goods	2,04
	Machinery	1,08
	Manures	90
Exports:	Jute goods	4,20
	Cotton	3,19
	Tobacco	21
	Spices	11

Indo-Swiss Trade

This trade is governed by a bilateral agreement. Imports from Switzerland include clocks and watches, machine tools, machinery for a machine tool plant to be set up near Bangalore, chemicals and textiles. Exports include leather, tobacco tropical woods and jewellary. Ties of trade between India and Switzerland are increasing.

Trade figures for two years in lakhs of rupees are:—

		Imports	*Exports*
1948-49	....	8,65	1,22
1949-50	....	7,54	2,47

Indo-Finnish Trade

Finland sends to India newsprint, paper and wood pulp and buys jute, tea, spices and oilseeds. The trade is under a barter agreement. Trade figures for two years in lakhs of rupees are given below:—

		Imports	*Exports*
1948-49	....	1,38	19
1949-50	....	1,17	19

Indo-Czech Trade. Under an agreement India was to buy diesel engines, shoe-making machinery, agricultural machinery and tube-well pumps from Czechoslovakia. In 1949-50 she bought goods worth Rs. 2,80 lakhs from her and sold goods valuing Rs. 1,22 lakhs.

Indo-Hungary Trade. India entered into a trade agreement with Hungary under which she was to import electrical goods, machinery and vehicles from her and to export jute, cotton, oil seeds and kyanite.

Indo-Polish Trade. India also entered into a trade agreement with Poland for buying cement, steel, machinery, textiles, optical instruments and raw films, and to sell in exchange jute, cotton, lac, mica, kyanite, tea and myrobalam extract.

India-Yugoslavia Trade was also carried under a barter agreement of selling jute for buying cement, maize and starch.

Land Frontier Trade

The land forontier trade of India now consists of (a) the trade across the frontiers of northern and north eastern India to and from Nepal, Sikkim, Bhutan and Tibet; (b) the trade along land routes through Western Pakistan between India and Afghanistan and Iran. The trade between India and Pakistan is not taken as land frontier trade, though it is largely such.

Land Frontier Trade with Nepal, Sikkim, Bhutan and Tibet

Nepal supplies much rice. The amount was about 150,000 tons in 1946-47. Wheat, grams and pulses are also imported. Nepal also sent 25,000 tons of jute in the same year. Mustard and rape seeds amounting to 25,000 tons and linseeds amounting to 10,000 tons were imported by India in this year. From the upper hilly regions of *Nepal, Bhutan* and *Sikkim,* and specially from *Tibet* many animal products enter India, the leading product being wool. About 10,000 tons of it were imported in 1946-47. Other imports were hides and skins, carpets and rugs, tobacco and borax.

Among exports to Nepal, Bhutan and Tibet are cotton textiles and yarns, dye stuffs, iron and steel goods, machinery, cutlery, hardware, petroleum, salt, sugar, tea, tobacco, copper and betelnuts. In 1946-47, 81,000 tons of salt was exported. Some grain is exported to Sikkim.

Land Frontier Trade with Iran.

The chief articles of import are fruits and nuts, while cotton textiles are among the most important exports. Figures of trade in 1946-47 in lakhs of rupees were:—

Imports:	Fruits and nuts	....	....	1,32
	Carpets and rugs	....	....	48
	Spices	....	....	36
	Drugs and medicines	....	....	21
	Raw wool	....	....	12
		Total	....	2,57
Exports:	Cotton textiles	....	....	24
	Tea	....	....	8
	Jute	....	....	5
		Total	....	65

Land Frontier Trade with Afghanistan

India imports fruits, nuts, skins and furs and exports cotton textiles, sugar and tea. Trade figures in lakhs of rupees for 1946-47 are given below:—

Imports:	Fruits and nuts	....	....	5,07
	Skins and furs	....	....	3,37
	Cotton raw	....	....	31
	Wool raw	....	....	18
	Wool manufactures	....	....	17
	Spices (Asafoetida)	....	....	10
		Total	....	9,73
Exports:	Cotton textiles	....	....	1,44
	Tea	....	....	48
	Sugar	....	....	21
	Boots and shoes	....	....	15
	Tyres and tubes	....	....	12
	Leather	....	....	7
	Iron and Steel	....	....	4
		Total	....	3,04

CHAPTER—XV

POPULATION AND POLITICAL DIVISIONS

The total population of India was 318.77 millions in 1941 excluding Pakistan. The density of population per square mile was 263.

The population of India has shown a steady increase as is evident from the table below. The increase was smallest in 1911-1921 due to the first World War and epidemics following it

Year	*Total Population in millions*	*density p. s. m.*	*Percentage increase*
1891	 279	175	—
1901	 284	179	1.8
1911	 303	191	6.7
1921	 306	193	0.9
1931	 338	213	10.6
1941	 389	246	15.0

The biggest percentage increase was in 1931-1941 when the population jumped up by 51 millions, so that it was increasing at the rate of 5 millions per year. Inspite of war and famine it seems that the population has continued its upward trend and is nearly one-fifth of the world population. The density of population of India as a whole is not very high, being exceeded by many European countries, but some of the highest densities occur in some districts of West Bengal and in Malabar. The thinly populated areas are in forested or hilly regions and in the deserts. The following table gives the population and its density in various political units of India:—

State	*Population in millions*	*Density per sq. mile*
Assam	.... 9.2	180
W. Bengal	.... 21.2	756
Bihar	.... 36.3	521
Orissa	.... 8.7	271
Bombay	.... 20.8	272
Madhya Pradesh	.... 16.8	170
Madras	.... 49.3	391
Punjab	.... 12.5	416
Uttar Pradesh	.... 55.0	518
Himachal Pradesh	9	90
Hyderabad	.... 16.3	198
Kashmir	.... 4.0	49
Travancore-Cochin	.... 7.5	840
Mysore	.... 7.3	249
Saurashtra	.... 3.5	110
Vindhya Pradesh	.... 3.6	142
Rajasthan	.... 8.0	100
Madhya Bharat	.... 7.2	155

An official estimate of the population of India was made in March 1950. It put the population of India at this time as 347.34 millions, an increase of 28.57 millions over 1941. The estimates in millions for states were as follows:—

Assam	.... 8.51	Ajmer	.... 0.73
Manipur	.... 0.54	Saurashtra	.... 3.96
Tripura	.... 0.58	Kutch	.... 0.55
W. Bengal	.... 24.32	Bhopal	.... 0.85
Orissa	.... 14.41	Madhya Pradesh	.... 20.92
Bihar	.... 39.42	Vindhya Pradesh	.... 3.88
Uttar Pradesh	.... 61.62	Madhya Bharat	.... 7.87
Delhi	.... 1.51	Bombay	.... 32.68
Punjab	.... 12.61	Hyderabad	.... 17.69
P. E. P. S. U.	.... 3.32	Madras	.... 54.29
Bilaspur	.... 0.13	Mysore	.... 8.06
Himachal Pradesh	.... 1.08	Coorg	.... 0.17
Kashmir	.... 4.37	Travancore-Cochin	.... 8.58
Rajasthan	.... 14.69		

Density of Population

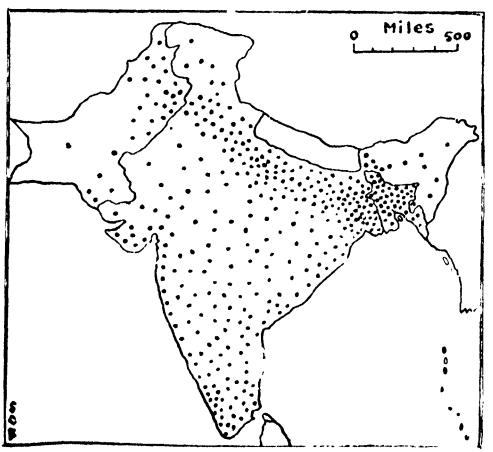
Factors controlling the density of population are

A. *For high density*

(1) *Agricultural prosperity*: Due to this factor the most densely populated areas are in W. Bengal and Malabar, the density gradually decreasing westwards in the northern plains, till it is least in Punjab.

(2) *Occurrence of Minerals*: The great density in the coal fields of Jharia is an example of it.

(3) *Industrialization or commercial and trade activity*: The great densities around Bombay, Ahmedabad, Asansol and Calcutta illustrate this.



Map 60

One dot stands for one million persons.

(4) *Level topography and easy accessibility*: The northern plains are densely populated due to this cause.

B. *For Low Density*

(1) *Rugged hilly regions*: The Himalayas are thinly populated and Kashmir has a low density of population

(2) *Dense forests*: Assam has a low density of population. The Sundarbans are thinly populated

(3) *Low rainfall and desert conditions*: Rajasthan has a low density of population.

Urban population: There is a tendency at present in India for greater urbanization. The population of nearly every city is on the increase. The population of Calcutta has nearly doubled since 1941. Industrialization is one of the causes of this tendency. The following table gives the population of important cities in lakhs in 1941:—

Calcutta	.... 21.1	Banaras	.... 2.6
Bombay	.... 14.9	Bangalore	.... 2.5
Madras	.... 7.8	Allahabad	.... 2.5
Hyderabad	.... 7.4	Madura	.... 2.4
Ahmedabad	.... 5.9	Sholapur	.... 2.0
Delhi	.... 5.2	Indore	.... 2.0
Kanpur	.... 4.0	Bareilly	.... 1.8
Amritsar	.... 3.9	Patna	.... 1.8
Howrah	.... 3.8	Trichinopoly	.... 1.6
Lucknow	.... 3.5	Baroda	.... 1.5
Nagpur	.... 3.0	Jamshedpur	.... 1.5
Poona	.... 2.6	Ajmer	.... 1.5
Agra	.... 2.6	Jubbulpore	.... 1.4

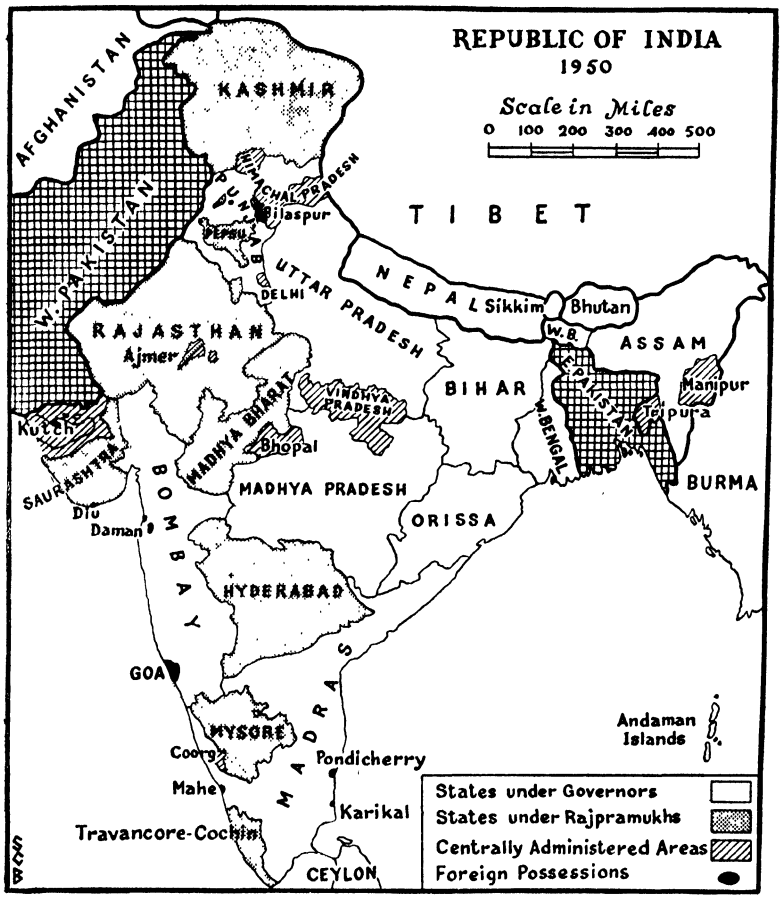
Political Division

On 15th August 1947 India was divided into two dominions. The bigger one was named India, and the smaller one, which was in two parts, one in the west and the other in the east was named Pakistan.

The next step was the *Political readjustment of the states.*

The following three different processes have been promoted and recognized by the Government of India in relation to the integration of States, each being applied according to size, geography and other factors relating to each State or group of States:

The first is the merger of the States in the adjacent Provinces now called States. Under this process 219 States with a total area of 84,774 sq. miles and a population of 120.18 lakhs were



Map 61

The new political division of the Indian Region showing India in 1950.

merged in the Provinces distributed as under:—

Province	*Number of states merged*	*Area in sq. miles*	*Population in lakhs*
Orissa	 23	23,637	40.46
C. P. and Berar	 15	31,749	28.34
Bihar	 2	623	2.08
Madras	 2	1,444	4.83
East Punjab	 3	370	.80
Bombay	 174	26,951	43.67
Total	 219	84.774	120.18

Later on more states such as Baroda, Kolhapur, Rampur, Banaras, Mayurbhanj, Cooch Behar, etc were merged

The second is the consolidation of States into centrally administered areas. This process affected 22 States consolidated into the following two units covering a total area of 19,061 sq. miles with a population of 14.37 lakhs :—

Name of State	*Number of States merged*	*Area in Sq. miles*	*Population in lakhs*
Himachal Pradesh	21	10.600	9.36
Kutch	1	8.461	5.01
Total	22	19.061	14.37

Later Bilaspur, Bhopal, Manipur and Tripura were added to this category. Delhi, Coorg and Ajmer continued to be treated as centrally administered areas.

The third is the integration of the territories of States to create new viable units. This process covered a total area of 150,400 Sq. miles with a population of 237.64 lakhs distributed over the States of Saurashtra, Matsya, Vindhya Pradesh, Rajasthan, Madhya Bharat and the Patiala and East Punjab States Union as under:—

States	*Number of States merged*	*Area in Sq. miles*	*Population in lakhs*
Saurashtra	217	31,885	35.22
Matsya	4	7,536	18.38
Vindhya Pradesh	35	24,610	35.69
Rajasthan	10	29,977	42.61
Madhya Bharat	20	46,273	71.50
Patiala and East Punjab States Union	8	10,119	34.24
Total	291	150,400	237.64

Later Rajasthan was enlarged, absorbing Matsya, Jaipur, Jodhpur, Bikaner and Jaisalmer in it. Travancore and Cochin were joined together. Vindhya Pradesh became a centrally administerd state.

Mysore continues as a separate unit.

Hyderabad did not accede to India in the begining. India undertook a "Police Action" in Hyderabad in September 1948. The Nizam's troops and irregulars surrendered to the Indian Army on 18th September. Hyderabad is now a separate unit of India. The Unions of States, Mysore and Hyderabad are governed by Rajpramukhs.

The former Provinces are now called States, and are under Governors.

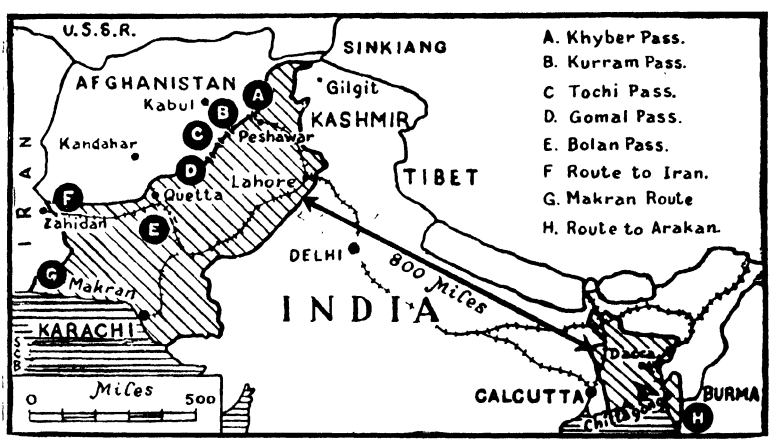
Kashmir acceded to India but was later invaded by raiders and Pakistan army. India has declared to abide by the decision of a plebiscite taken by the people of Kashmir. At present the armies of India and Pakistan occupy different portions of the State. The Kashmir Valley proper with Srinagar is on the Indian side. The case of Kashmir was put by India before the U. N. O. A United Nations Commission visited India, Pakistan and Kashmir and reported to the U. N. O. meeting in Paris in October 1948.

A "Cease fire" was agreed upon in January, 1949. A cease fire line has been marked out separating areas under India and Pakistan. The U. N. O. appointed Sir Owen Dixon as mediator in the Kashmir Dispute in May 1950. He, however failed in his efforts, and the political future of Kashmir is still uncertain.

CHAPTER XVI

PAKISTAN

Pakistan was born on 15th August, 1947 after being carved out from India. Her total area is 361,311 square miles and population (based on 1941 census) 70,085,449. Pakistan consists of two parts West and East, separated by nearly 800 miles. The western part has an area of 306,962 square miles and the eastern part is 54,349 square miles, so that it is less than one fifth of the former in size. But its population is 41,828,300 as compared to 28,257,149 in the West. So the population of East Pakistan is

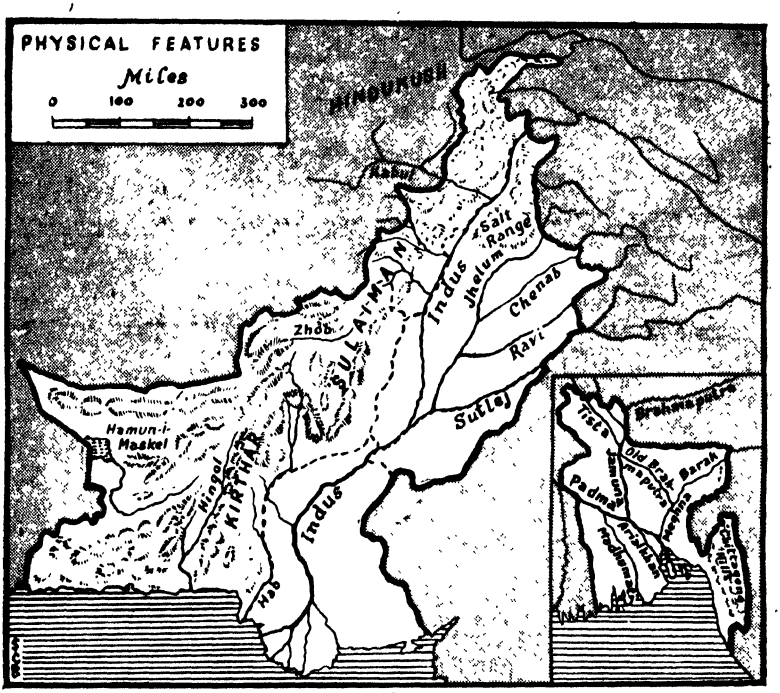


Map 62
The two Pakistans and their neighbours.

48% more than that of West Pakistan. The density of population in the east is 769 per square mile, as compared to 92 in the west. The overall density of population of the whole of Pakistan is 194 p. s. m. The existence of the country in two parts 800 miles apart has obvious disadvantages. Thus the shape of Pakistan is not conducive to her prosperity. A parallel example of such a country with two separate parts was Germany before the war, when East Prussia was separated from the parent country by a narrow strip of Polish territory.

Physical Features of Pakistan

Similar to size, shape and population, East Pakistan differs radically from West Pakistan in physical features. While East Pakistan is largly a flat alluvial delta, nearly half of West Pakistan consists of hill ranges and plateaus. They are dealt with separately below.



Map 63
Physical features of Pakistan.

West Pakistan

The eastern portion of W. Pakistan consists of flat alluvial plains watered by the Indus and her eastern tributaries Sutlej, Ravi, Chenab and Jhelum. In Punjab, leaving out portions of the Districts of Attock, Rawalpindi and Jhelum, a small part in the north of Mianwali and a strip to the west of Dera Ghazi Khan, the whole of the province is below 1500 feet. Bahwalpur and Sind (execpt part of the District of Dadu) are desert expanses

below 500 feet. Irrigation from Sutlej and Indus has transformed parts of these desert lands to cultivated fields. The topography in this region is, on the whole, conducive to the construction of canals. The virgin soil which was originally covered by scrub jungle now gives rich harvests of wheat and long staple cotton.

The flat nature of land has also helped in the construction of railways and roads. The rivers are frequently bridged, being not as broad and big as in East Pakistan. Many towns and trade centres have developed in the flat lands of Punjab.

All the major rivers of W. Pakistan have their sources and upper parts of their basins in India. *River Sutlej* first touches the boundary of Pakistan fifteen miles east of Kasur, flows along the border up to Sulemanke headworks and then enters Pakistan.

River Ravi tonches the border of Pakistan below its junction with river *Ujh,* flows along the border to a point twenty miles North-East of Lahore and then enters Pakistan.

River Chenab is a much bigger river than Ravi. It enters Pakistan about twenty miles north of Sialkot and joins the river Ravi near Sarai Sidhu.

River Jhelum rises in the Kashmir Valley and first touches the border of Pakistan near Domel. It then flows along the border up to Mangla headworks, fifteen miles below which it enters Pakistan. It joins the Chenab near Jhang Maghiana.

The combined waters of Ravi, Chenab and Jhelum fall into the Sutlej forty miles West of Bahawalpur town. From this junction the combined waters of the four rivers are called as *Panjnad,* which means five rivers (the fifth river being Beas, which now lies completely in India). After another fifty miles the waters of Panjnad flow into Indus south of Dhaka.

River Indus like Sutlej rises in Tibet near Lake Manasarowar. It flows through Kashmir and enters Pakistan near Sazin on the border of Swat territory. It receives a number of small tributaries from the West, among which *Kabul* with its northern tributaries *Kunar* and *Swat* is the most important. The other tributaries are *Kurram* and its tributary *Tochi, Gomal* and its tributaries *Kundar* and *Zhob, Nari* and *Gaj.* Indus is a mighty river, being

fed by the melting snows of the entire Karakoram Range, nearly half of the Himalayan Range from Manasarawar to Nanga Parbat, and a major part of the Hindukush Range in Afghanistan. The supply of water is large enough to keep the Indus flowing all the year round through the great Sind desert to the Arabian Sea.

The mountain ranges of W. Pakistan reach their highest level in *Tirich Mir* peak in Chitral, which is 25,263 feet high above sea level. Here the northern border of Chitral is flanked by *Hindukush Range*. *Chitral, Dir, Bajaur, Swat* and *Buner,* lying north of the Kabul Valley are all highly rugged and mountainous countries, inhabited by north-western tribes. South of this area is the comparatively flat and well cultivated *Kabul Valley,* with Peshawar in its centre. Up the Kabul Valley is the famous *Khyber Pass,* the road and the railway running slightly south of the river to *Landi Khana* on the Afghan border. The road passes beyond the border to Kabul, the capital of Afghanistan. From here a road runs across the Hindukush Range by the *Bamian Pass* to a point on river Oxus (Amu), on the border of U. S. S. R. On the other bank is *Tarmez* on the Russian railway to Stalinabad. A 200 mile rail link between Landi Khana and Tarmez will join the Indo-Pakistan railways with the Russian and so with the European railways. There is much trade between Afghanistan and Pakistan along the Khyber route.

South of the Kabul valley the rugged, hilly horn of *Parachinar* juts out to the west ending in *Sikaram* peak 15,620 feet high. The northern edge of Parachinar is formed by the *Safed Koh Range*. East of the horn is the hilly tract of *Kohat*. Up the Kurram valley is the *Kurram Pass* the route going through Parachinar to Ghazni.

Further south are the cultivated valleys of Kurram in *Bannu* and Gomal in *Dera Ismail Khan*. But to the west of these tracts are the rugged hills of *Waziristan*. The *Tochi Pass* lies beyond the route to *Miram Shah*. The *Gomal Pass* is near *Khajuri Kach*. The strategic border towns of *Razmak* and *Wana* are of great importance to the defence of Waziristan.

A lobe of hill ranges called the *Salt Ranges* run *south*-westwards between Indus and Jhelum at the northern corner of Punjab. This is a highly mineralized area. Being easily

accessible, it is being exploited for quite a long time. It contains mineral oil, coal, gypsum and rock salt.

South of Waziristan are the tracts of *Zhob* and *Loralai*, with *Toba* and *Kakar* ranges to the north and the *Sulaiman Range* to the east, which attains its maximum height in *Takht-i-Sulaiman* 11,100 feet high. A lobe from the Toba range runs south of Hindubagh, culminating in *Khalifat* (11,440 ft.) and *Zargun* (11,738 ft.)

West of the Sulaiman Range is the *Nari valley*, and along it towards the north is the *Bolan Pass*. This route is next in importance to the Khyber route. The road and the railway run along this route to *Quetta*. They pass further across the *Khojak Pass* to *Chaman* on the border. From here a track leads to *Kandahar* in *Afghanistan*. The track further goes north through *Herat* to *Meshed* on the Russian border. The distance between the railhead at Chaman and the Russian railway at Meshed is about 600 miles.

From near Quetta the hill ranges spread out like a fan towards the west and the south. *Chagai Range* runs along the northern border. Along its southern edge is the *Zahidan* route along which a railway runs from Quetta to Zahidan. Much trade passes on this route between Iran and Pakistan, and the traffic is on the increase. The Chagai Range is also rich in mineral deposits, sulphur being the most important. South of the Chagai Range is the depression of *Hamun-i-Mashkel*, which is in the centre of an inland drainage basin. The *Siahan Range* runs south of the depression. The hills, running fanwise south and east of Siahan end in the *Kirthar Range*, running north-south between Baluchistan and Sind. In between these hills are river valleys, such as those of *Hab*, *Hingol* and *Dasht*. The hills of Baluchistan are dry and devoid of vegetation, giving a parched brown appearance to the landscape. The rivers contain but little water, and are dry except when they momentarily carry the turbid, silt-charged waters of occasional showers.

East Pakistan

Nearly the whole E. Pakistan is a level expanse of land formed by alluvium brought by rivers. Only the *Chittagong Hill Tracts* contain forest-covered ridges, rising from one to three

thousand feet. The hills and the valleys run in parallel lines, roughly in a north-south direction. With an annual rainfall of over 100 inches they contain much potential hydro-electric power. The places where the rivers cut through the ridges transverse to the grain of the land, provide ideal sites for hydel stations. Mineral oil and coal occurs in them. They are also suitable for growing tea. *River Karnaphuli* cuts through the ridges transversely below Rangamati. It sends tributaries like *Maiyani* and *Sajjuk* running between the parallel ridges both northwards and southwards. Work on the hydel project on Karnaphuli is progressing. *River Sangu* runs from south to north in the southern part of Chittagong Hills. It cuts transversely through the hills below Bandarban and flows into the sea. The coastal plain in Chittagong is traversed by numerous little streams running down to the sea from the hills.

River Padma or *Ganges* cuts through the middle of E. Pakistan, flowing from west to east. It touches the border of Pakistan south of English Bazar, flows along the border for about fifty miles past Rampur Boalia, and enters Pakistan twenty miles West of Sara Bridge, which is the only bridge which spans this mighty river in Pakistan. It joins *Jamuna,* a powerful distributary of *river Brahmaputra* near Goalundo. Flowing another sixty miles Padma broadens out ten miles north of Chandpur and is joined by Meghna from the east. Further down the Padma is called Meghna and it expands like a funnel, which is dotted by numerous big and small alluvial islands. All these big rivers are navigable by steamers and constitute the chief means of communication. Padma and Jamuna divide the entire alluvial plain into three segments.

The northern segment lies between the Padma and Brahmaputra-Jamuna. Brahmaputra enters Pakistan ten miles south-west of Dhubri and flows very near the border for about fifty miles. Above Bahadurabad the old bed of the river branches out towards the east, but the major portion of the water runs south along the Jamuna. *Torsa* rising in Tibet after joining *Jaldhaka* falls in Brahmaputra near Kurigram. Further down *Tista,* which rises in Sikkim falls in Jamuna near Ghoraghat. *Atrai* rising in the plains of Jalpaiguri (in India) and *Karatowa* rising in the plains of Rangpur (in Pakistan) flow into the Jamuna

near Bera. The lower course of *Mahananda* lies in the Rajshahi district of Pakistan. It falls in Padma near Nawabganj. All these tributaries of Brahmaputra-Jamuna and Padma have broad sandy beds and are heavily flooded during the rainy season. In winter, however, they are narrow wriggling streams. Hence they are of little use for steamer navigation. Country boats, however, ply along them wherever possible. In the northern part of this segment is a large patch of infertile old alluvium, lying as a swell, covered by forest and scrub called *Barind.* In the south is a large swamp called *Chalan Bil.*

The southern segment lies south and west of Padma and Meghna. Here a large number of distributaries fan out from Padma and flow in intricate meanders, mingling with each other and ultimately expanding into broad tidal creeks in the south. They produce a net work of navigable waterways in which steamers ply, execpt in the extreme north-west. Waterways are the most important means of communication in the region. The broad rivers are unbridged. The most important distributary is *Madhumati.* Further east is another broad distributary named *Arial Khan.* In the west are a number of rivers such as *Rupsa, Bhairab, Kumar* and *Mathabhanga.* Along the western border, in the south are *Ichhamati* and *Kalindi.* All over the area are hundreds of ox-bow lakes, cut-offs and bils (or shallow water swamps). In the south are dense mangrove forests called Sundarbans, through which flow numerous inter-connected tidal creeks, which open out into the Bay of Bengal. Some important creeks from east to west are *Malancha, Marjata, Pussur* and *Haringhata.*

The eastern segment is the largest of the three. It lies east of the broad unbridged river line of Brahmaputra, Jamuna, Padma and Meghna, running through the country from north to south. This area is very fertile, being mainly covered by fresh alluvium, execpt the forest of *Madhupur* north of Dacca where there is a large patch of old alluvium. *River Kushiyara* enters it from the north-east, and is called *Barak* further down. Here it is joined by river *Surma* from the north. The combined stream then joins the old *Brahmaputra* which comes from the north-west. Here it is a broad river which is now called Meghna. Many

other rivers traverse the region and join with each other producing a net work. Meghna is navigable by steamers and boats ply in many other rivers.

Natural Regions

Pakistan may be divided into eight natural regions in the light of her physical features discussed earlier, together with their influence on human activity

Western Pakistan may be divided into four natural regions and East Pakistan into four others as follows:—

(1) *North-western mountains and valleys.* They extend from Chitral in the north to Quetta and Loralai in the south, roughly to the west of river Indus. Here are the high mountain peaks of Pakistan like Tirich Mir, Takht-i-Sulaiman and Zargun. The topography is very rugged. In between are the fertile valleys of Kabul, Kurram and Gomal. The area is rich in minerals, which have not yet been fully exploited.

(2) *Baluchistan.* It consists of a sparsely populated arid plateau, with ridges running over it, fanwise, from the north-eastern corner. It is also rich in minerals not yet fully known or exploited.

(3) *The plains of Punjab.* These consist of the rich agricultural lands watered by Sutlej, Ravi, Chenab, Jhelum, Indus and canals taken out from them. The density of population here is the highest in W. Pakistan. A number of important towns are scattered in the plains and are connected by a network of roads and railways. Industry is concentrated in the northern fringe from Lahore to Rawalpindi.

(4) *Sind desert.* It spreads from Bahawalpur and Multan to the mouth of river Indus. Much of it is a vast sandy desert, covered by scrub jungle and thorny bushes here and there. Only the irrigated regions of the Sukkur barrage canals are cultivated, but as the soils are rich virgin alluviums, they give a very good return. Population is very sparse. Industry is developing around the port of Karachi.

(5) *Chittagong hill tracts* and coastal plains. They seem to have a bright future. They only await the development of the port and hydroelectric power. Plans are already ahead for

constructing jute mills and a big paper mill here. Tea may be grown in the hills. Coal has been found and there is a possibility of finding mineral oil. The coastal plains are densely populated.

(6) *Padma-Jamuna Doab.* This region consists of comparatively less rainy cultivated plains. Besides jute and paddy, tobacco is a special crop here. The rivers have broad sandy beds and are not good for navigation.

(7) *The delta.* This is the region south of Padma. It is a densely populated rich agricultural region. The distributaries of the Padma spread here in a net work and are nearly all navigable. There are fewer roads and railways and more steamer routes. In the south is a dense forest called Sundarbans. The rivers abound in fish. Areca-nuts and coconuts are also grown extensively.

(8) *Meghna basin.* This region lies east of the Jamuna-Padma-Meghna river line. In its centre flows Meghna. It has a high amount of rain with very little variability. Rivers are deep and navigable and destructive floods are rare. Soil is mainly fresh, rich alluvium. This is the most densely populated region of Pakistan. At places the density is above 3000 p. s. m. Jute, the golden fibre, is grown extensively here. Industry is concentrated around Dacca. Rivers are navigable and there are fewer roads and railways. There are many large river ports dealing with jute.

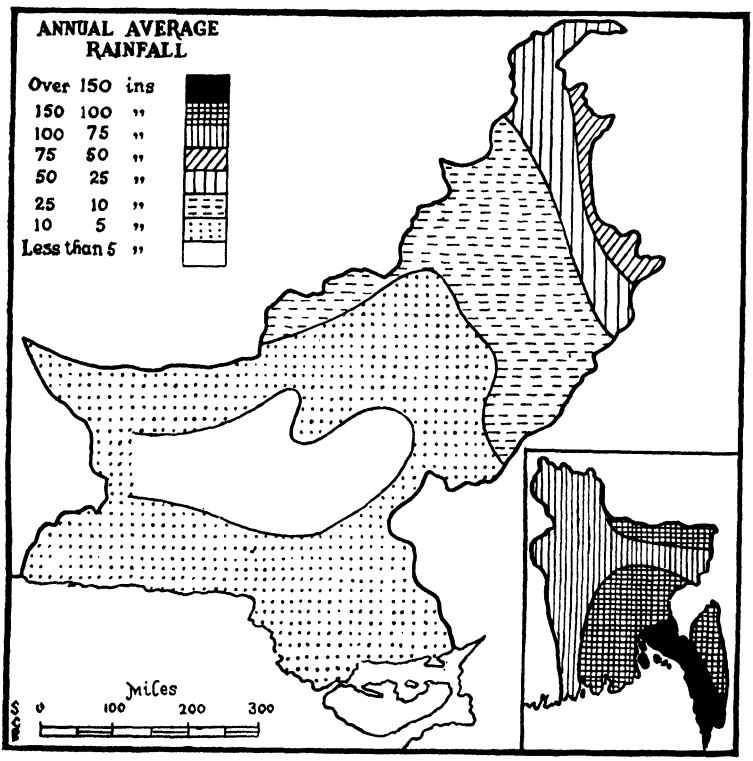
Climate

The character of climate in W. Pakistan is so different from that in E. Pakistan that both of them are dealt with separately.

W. Pakistan. The climate of this part of Pakistan is dry and extreme. Only a narrow belt along the northern edge of Punjab and the hills of Parachinar, Dir and Chitral in N. W. F. P. get more than 20 inches of rain annually. A large portion of southern Punjab and Sind and nearly the whole of Baluchistan get less than five inches of rain per year. The extremity of climate is evident from the great extremes of temperature at various stations. The observatory at Jacobabad has several times

registered 126°F and over in shade.*' The lowest minimum recorded in Quetta is 3°F, which is 29° below freezing point. Even Karachi on the sea coast, which has an equable climate once recorded a maximum of 116°F and a minimum of 31°F.

In April W. Pakistan is not uncomfortably hot. Very often the early part of this month is fairly cool. In May the temperature



Map 64
Annual Rainfall in Pakistan.

begins to rise and the last part of this month together with the first half of June is extremely hot. The air is parched and dry. Trees shed their leaves. Even the grass is parched brown. Water-table goes down and wells dry up. Maximum day

*Field Sciences of India. Indian Science Congress Special Silver Jubilee number, 1938.

temperatures of 110° to 125°F are usual. Only xerophytic vegetation can stand such a climate. *"Loo"* or hot dust laden wind blows during, the day and sometimes even during the night. Dust storms blow in the evening, darkening the sky. The dust settling down in the fields after a storm is often quite thick. It adds to the fertility of the soil. In N. W. F. P. in the hilly regions the evening storms are sometimes followed by rains. The total rain from March to May here is about 2 inches in Quetta area and 5 inches north of the Kabul valley.

A very deep low pressure trough develops in Sind in May, going down to 29.4". This is instrumental in the creation of the wet south-west monsoon all over the Indo-Pakistan region. Thus the cause of heavy rainfall in E. Pakistan is found in W. Pakistan. The monsoon, however, arrives in West Pakistan in the first week of July, and reaches N. W. F. P. and Baluchistan after 15th July. The Arabian Sea current gives a little rain in Karachi and the Sind delta. The Bay of Bengal current blows up the Ganges valley from the south-east and reaches Punjab in the middle of July. July is the rainiest month in Punjab and Sind. The annual rainfall in Lahore is 18.1 inches, of which July gets 5.1", August 4.7" and September 2.3". The annual rainfall in Karachi is 7.6" of which 4.9" falls in July, August and September. Multan gets 7.1" in the year and 4.5" in July, August and September. In Peshawar the monsoon reaches late and the rainiest month is August with 2.2", the annual rain being 13.4". The monsoon withdraws completely from W. Pakistan in September.

October, November and December are the driest months in W. Pakistan. It is at this time that wheat and other Rabi (winter) crops are sown. Rainfall in monsoon is very uncertain, the variability being nearly 40% on the average. But this does not matter so much for many reasons given below:—

(a) The summer or Kharif is not the important crop, in W. Pakistan and so its partial or complete failure does not matter so much.

(b) Kharif crops are generally hardy millets and they can stand quite a lot of variability in the supply of moisture.

(c) The Rabi crop is much more important in W. Pakistan, but it does not depend so much on summer rain, as upon the date of departure of the monsoon, after which it is sown.*

(d) Variability is well covered in the irrigated regions.

In January and February dry, cold northern winds are very strong. They are called the north-east monsoon, but they may as well be called the north-east trade wind. During these months cyclonic depressions, perhaps travelling all the way from the Mediterranean region, enter W. Pakistan from the west and pass away to India across the border. They are called *western disturbances.* They give rainfall in W. Pakistan, specially in the west. Quetta has more rainfall from them than from the S. W. monsoon, and out of an annual rainfall of ten inches, January. February and March get six inches. Peshawar also gets 4.7" from January to March, as compared to 4.6" from July to September. Rain in January and February is very useful for wheat and other Rabi crops. During the passage of western disturbances weather changes rapidly. Wind circulates anticlockwise around a depression. Warm winds are sucked from the south at the approach of a depression. The sky gradually becomes grey and drizzling rain starts falling. As the depression passes away, clouds break and a cold northerly wind springs up, bringing in a cold wave. Nights are clear, cold and frosty.

East Pakistan. The climate of E. Pakistan is hot, moist and equable. The range of temperature is 6° to 10°F as compared to 40° in W. Pakistan. While July is the hottest month in W. Pakistan, May is the hottest in East Pakistan. Very often the highest maximum for the year occurs in April. This is due to the early arrival of monsoon, which arrives in Chittagong after the middle of May and spreads all over E. Pakistan by the end of this month. In the pre-monsoon hot season from March to May conditions are similar to W. Bengal. Only there are more nor'westers, which give much rain. The showers generally come in the evening. They are highly useful for sowing "aus" paddy. Often they are accompanied by gales of great intensity which destroy soft-stemmed plants like plantains, and are responsible

* Asia, L. W. Lyde.

Table—Monthly average Rainfall (inches) and Temperature (°F)

West Pakistan.

Stations		J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.	Annual
Lahore	In.	0.9	1.0	0.8	0.5	0.7	1.4	*5.1*	4.7	2.3	0.3	0.1	0.4	18.1 (Total)
	°F	53	57	69	81	89	*93*	89	87	85	76	63	55	75 (Average)
Peshawar (1,100 ft.)		1.5	1.3	1.9	1.8	0.7	0.3	1.7	*2.2*	0.7	0.2	0.6	0.5	13.4
		50	53	63	74	84	*91*	90	88	82	71	59	51	71
Quetta (5,500 ft.)		2.1	*2.1*	1.8	1.1	0.3	0.2	0.5	0.6	0.1	0.1	0.3	0.8	10.0
		40	41	51	60	67	74	*78*	75	67	56	47	42	58
Jacobabad		0.3	0.3	0.2	0.2	0.2	0.1	1.2	*1.2*	0.2	0	0.1	0.2	4.2
		57	62	75	86	94	*98*	95	92	89	79	68	59	80
Karachi		0.6	0.3	0.1	0.1	0	0.4	*3.2*	1.8	0.7	0	0.2	0.2	7.6
		65	68	75	81	85	*87*	84	82	82	80	74	67	78

East Pakistan (Rainfall only).

Chittagong	0.4	1.0	2.4	4.4	9.3	21.7	*23.5*	20.3	12.7	6.7	1.7	0.7	104.8
Dacca	0.4	1.1	2.6	4.9	9.6	*13.4*	12.9	12.6	9.4	4.3	0.8	0.2	72.2
Jessore	0.5	1.0	1.8	3.9	7.9	*13.2*	11.6	11.2	9.0	5.3	1.2	0.2	66.8
Dinajpur	0.4	0.6	0.8	2.2	7.2	14.3	*14.9*	12.4	12.3	4.2	0.1	0.1	69.5

for many boat disasters. Even steamers have to take care of them. They are aptly called "*Kal Baishakhi*" or deadly April winds. Dacca gets 17 inches of rain from March to May.* Nearly the whole of E. Pakistan gets 10 to 30 inches of rain in this season, the largest amount being received in the Mymensingh-Dacca region.

The monsoon strikes the Chittagong coast and hills at right angles with full force in the middle of May and spreads all over East Pakistan within a fortnight. From June to October there is heavy rain all over the province. The western parts get 50 to 70 inches, while the eastern parts get 70 to over 100 inches. The heaviest precipitation is in Chittagong and Mymensingh. Depressions produced in the Bay of Bengal always bring heavy rainfall. Some of them which turn eastwards produce very heavy rainfall in E. Pakistan.

In its retreat from the northern Indo-Pakistan plains the monsoon leaves Chittagong last of all, where it also arrives earliest. From November to December Noakhali and Chittagong receive 2 to 5 inches of rain. A belt from Khulna and Barisal to Dacca and Mymensingh receives from one to two inches. The north-western portion receives less than one inch.

January and February are dry months with cool northerly winds. Some western disturbances or secondaries associated with them produce some rainfall which does not exceed two inches for these two months. Very often both these months are completely dry.

The table gives average monthly temperatures and rainfall for some stations in Pakistan.

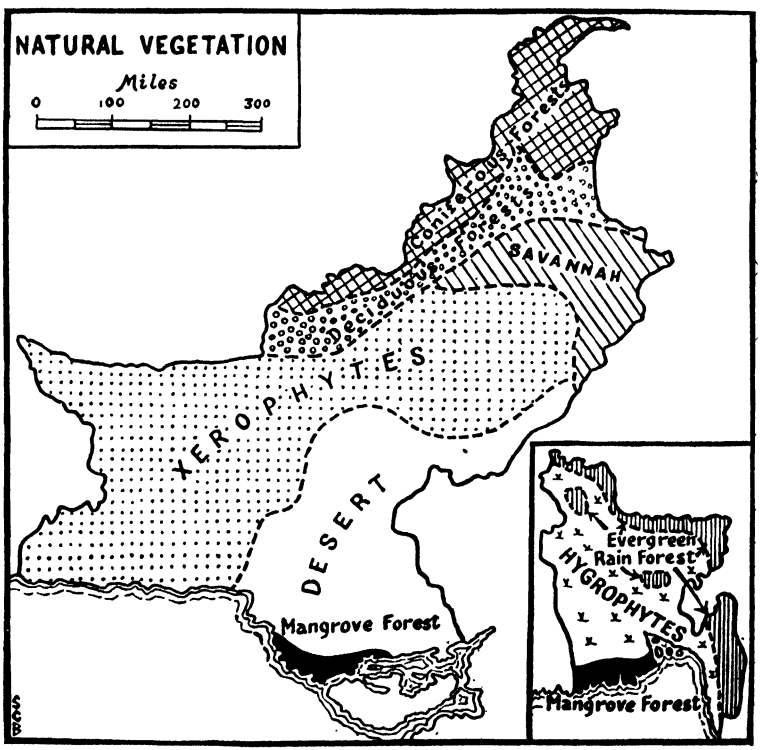
Natural Vegetation and Forests

Due to the great difference in rainfall, which is the chief controlling factor of forest types in Indo-Pakistan region, the natural vegetation of East and West Pakistan differ greatly from each other. While plants is E. Pakistan are *hygrophytes* or water-loving, those of W. Pakistan are *xerophytes* or drought-loving.

In *E. Pakistan* 7,184 square miles of land are classified as covered with forests which is 14% of the total area. The following forested regions are important:—

* Climatology, Austin Miller.

(1) *Chittagong Hills.* These are covered with dense evergreen rain forests, which are so dense that it is extremely difficult to exploit them. *Boga-Poma* (*Chikrassia*) gives a hard and strong wood, which is used for furniture making and house-building.* *Nahar* (*Mesua ferrea*) also occurs in Chittagong. It is very hard and strong, but difficult to season. It is used for railway sleepers and boat-building. Bomboos of various kinds are



Map 65
Natural Vegetation and Forests.

found extensively. They will supply raw material for the paper mill to be established near Chittagong.

(2) *Sundarbans.* It occurs in the southern parts of Khulna and Barisal. It contains dense mangrove forests. *Sundri*

* The Common Commercial Timbers of India, H. Trotter.

(*Heritiera minor*) and *Pussur* (*Carapa moluccensis*) are two important timber woods. Fire-wood and tanning material is collected from these forests. Honey is also collected. Fish abound in the tidal creeks.

(3) *Barind* is a large forest in Dinajpur. It is a mixed forest of deciduous and evergreen trees growing on a patch of old alluvium.

(4) *Madhupur* is another large forest similar to Barind. It is situated north of Dacca.

Besides the above four forests there are some forests along northern and eastern borders of Sylhet, which continue into Assam.

Some important timber trees of E. Bengal are Jarul (Legerstroemia flos-regina), Gamari (Gmelina arborea) and Gurjan (Dipterocarpus). The timber is used for boat-building and railway sleepers.

The plains of E. Pakistan contain scattered forests here and there. But here hygrophytes are most important. Various types of grasses growing in marshes and fringes of bils (shallow lakes) are of great economic importance. *"Pati" grass* is used for making mats which are in great demand all over Pakistan and India. *"Madur"* mats are made from another type of grass. *"Shola"* is the pith of the stem of a type of grass growing in marshes. It is used for making floats for fishing nets, for shola hats and for ornamental crowns used in religious ceremonies and marriages. *Hogla* is another grass which is used for making rough mats. Bamboos are found extensively all over the plains.

A 30 years sceme has been prepared to develop forests in East Pakistan. Under the scheme all private forests will come under scientific management. 3,500 square miles of waste lands will be afforested. Trees will be planted on road side and canal side lands. The aim of the scheme is to make E. Pakistan self-sufficient in sal timber and to remove the acute shortage of timber and firewood.

West Pakistan contains 5,897 square miles of forests distributed as follows*:—

Province	*Area*	*Percentage of total area*
Baluchistan	2,259	4.17
Punjab	1,884	3.20
Sind	1,161	2.46
N. W. F. P.	593	4.13

The forests here are mainly xerophytic in plains as well as hills. The chief types of forests are given below.

Mountain forests of two types (a) *Coniferous* and (b) *Deciduous* are found along the western border from Quetta to Chitral. Conifers are generally found above 5,000 feet. In the lower fringes are the Chir pines which occur extenively in the Murree hills and N. W. F. P. Higher up are cedars, firs, spruces and deodars. The pines give resin by tapping. The soft woods are used for packing boxes, cheap furniture and sleepers after treatment. Pine plantations are being grown in Murree hills. Another cantribution from these forests are medicinal herbs, such as Ephedera, Artemisia, Pyretherum, Malefern, Belladona and Nuxvomica. Above the Coniferous belt in Chitral Parachinar, Takht-i-Sulaiman and Ziarat are alpine meadows used for pasture in summer

Below the pines is the deciduous belt containing chestnuts, walnuts, oaks and junipers. They supply good quality furniture wood. Further down in the plains are found groves of mulberry trees. They spread from Baluchistan to Punjab. Some silk is produced in these forests, which has lead to the establishment of silk industry in Karachi. In Punjab the mulberry wood is used for making sports goods, such as rackets, bats and hockey sticks. Sialkot is a leading sports goods producing centre.

A belt of tropical grasslands mixed with a few trees spreads south and east of the hills in Punjab. This type of vegetation resembles the *savannas,* but it has been generally cleared for cultivation. Yet it persists in sandy tracts.**

The rest of the plains of Punjab and Sind and the plateau of Baluchistan contain a very poor vegetational cover, consisting of

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* Three years of Pakistan. Pakistan Govt. Publication.

** Plant Geography, M. E. Hardy.

xerophytic bushes and plants. They are thorny and have very few, small or flably leaves. Their barks and leaves are covered by a wax-like material which does not allow moisture to escape. They have deep long roots. The most important tree is *babul* (*Acacia arabica*). It gives a very good type of fuel wood and charcoal. It is used for making cart wheels and ploughs. Gums, tanning material and dyes are also collected. Other characteristic xerophytes are *palms* and *cactii* which are found extensively. *Jhand* (*Prosopis spicigera*), *Tamarix, Salvadora* and *Capparis* are other common plants. *Karil* is a very common leafless bush. *Nannorhops ritchieana* is a very common gregarious bush in the dry hills of N. W. F. P. and Baluchistan.

The Government of Pakistan has established a Forest Research Institute at *Upper Topa* (Murree Hills) for training forest officers and carry on research in silviculture, entomology, forest botany, forest chemistry and forest utilization.

Soils

The soils of E. Pakistan mainly consist of fresh deposits of fertile *alluvium*. Only two patches of *old alluvium*, mentioned earlier, are found in Barind and Madhupur jungles. Generally speaking the soils are sandy in the north and east, and clayey in the south. But mostly they are rich loams. In marshy regions *bog soils* are found. When exposed they produce soils rich in organic matter. In the tidal creeks in Sundarbans, and along the coast *saline soils* are found. They contain a big proportion of clay.

In W. Pakistan *glacial soils* are found above 12,000 feet round about Tirich Mir in Chitral. *Podsols* are common in the coniferous forests of Murree and N. W. F. P. Further down in the deciduous forests of oaks, chestnuts and walnuts rich *brown forest soils* are found.

The plains of Punjab and Sind are covered by *fresh alluvium*. But patches of *old alluvium* with lime concretions called *kankar* are found as banks and swells. In the drier south, where rain is not enough to wash away salt, the soils are saline. This decreases their fertility. *Sandy sierozems,* or desert saline soils are common in Baluchistan. Some *loess* or wind-borne soils are

also found here. Coastal saline soils are found in the Indus delta.

Soil Erosion. This is practically absent in E. Pakistan, but is a very great menace in W. Pakistan. It is specially intense in the hilly border regions in the north of Punjab, in the Salt Ranges in Jhelum, Rawalpindi, Attock and Mianwali, and in a belt along the eastern border of Baluchistan.* Efforts to stop soil erosion have been feeble Some experimental work in soil erosion control methods has been done in Salt Ranges, but the results have not been generally applied. *Bad lands* and *gullies* are quickly destroying good cultivable land in these areas. Run-off is quick after the meagre rains, and so the water-table is going down generally. This goes against afforestation, and even standing trees are killed by the lack of water supply. Over-grazing is a very important cause of soil erosion. Farmers should be taught soil erosion control methods. Wind-screens in the form of lines of trees should be grown in Baluchistan where wind erosion is common. Gully-plugging, turfing and afforestation should be used in Punjab and N. W. F. P.

Irrigation

There are practically no irrigation works in E. Pakistan. Here drainage and the problem of the removal of excess water is much more important than irrigation. Winter crops like sugarcane, potatoes and vegetables require irrigation, which is done by hand labour.

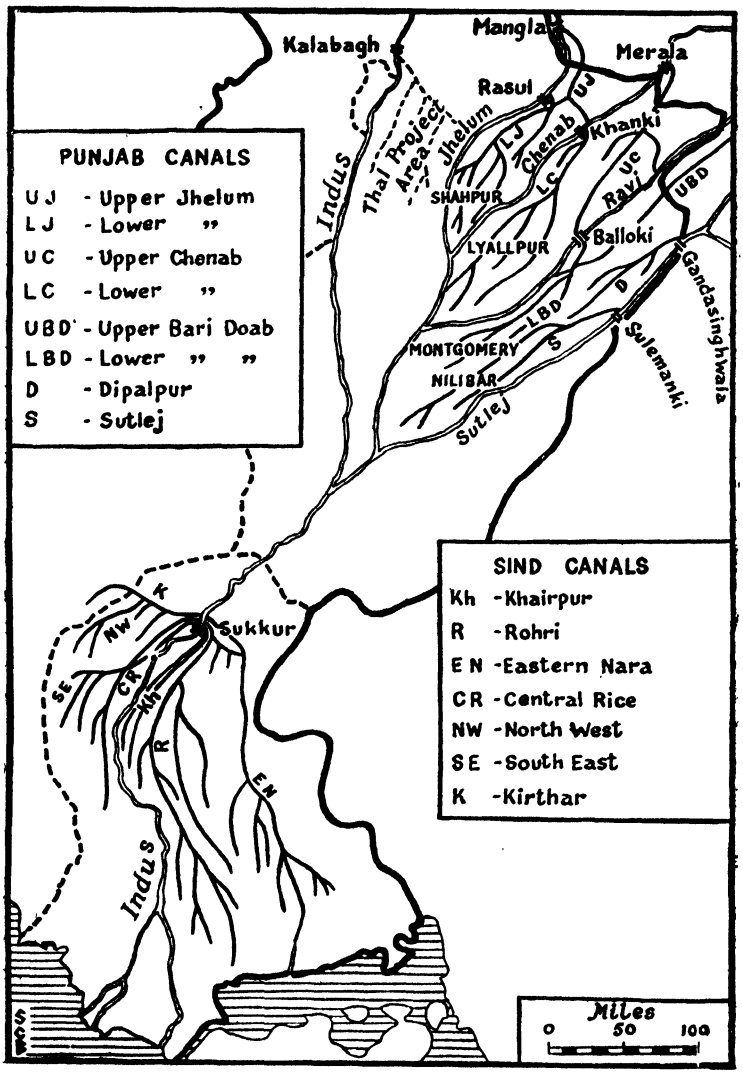
In W. Pakistan, however, there are large irrigation works. These are described below.

Irrigation works of Punjab

The canal system of Punjab is one of the finest in the world. The canals are linked up with each other and form a compact system. The Upper Jhelum Canal, the Upper Chenab Canal and the Lower Bari Doab Canal are together called the *Triple Project* as they depend upon each other.

* Pressure of Population and Misuse of Land in Punjab; Afforestation in Punjab, R. Maclagan Gorrie.

Upper Jhelum Canal has its head-works at *Mangla* just inside Kashmir. It irrigates the upper Jech Doab. Its tail waters fall in Chenab above Khanki, from where the Lower Chenab



Map 66
Canals of Western Pakistan.

Canal is taken out. Surplus water in Jhelum may thus be transferred to the lower Rechna Doab if required.

Lower Jhelum Canal has its head-works at *Rasul* on the Jhelum, 60 miles below Mangla. It irrigates the lower, southern portion of the Jech Doab, which is known as the Shahpur Colony, being transformed from a semi-desert to rich grainland. It has 600 miles of water channels which irrigate one million acres of land.

Upper Chenab Canal comes out of Chenab at the *Merala* head works. After irrigating the upper Rechna Doab, its main branch passes across the Ravi over an aqueduct at *Balloki level crossing.* The waters of Chenab are thus carried to the lower part of the Bari Doab, where they supplement the Lower Bari Doab Canal. If the extraction of water from the Chenab at Merala is too much, the water from Jhelum taken at Mangla is diverted to the Chenab at Khanki to supplement the Lower Chenab Canal.

Lower Chenab Canal takes from the Chenab at *Khanki,* and irrigates the famous wheat producing region of Lyallpur in the lower part of Rechna Doab. This area was once a semi-desert inhabited by nomadic tribes. The 2,500 miles of the channels of this canal irrigate over two million acres of land.

Lower Bari Doab Canal. It takes its waters both from the Ravi as well as the canal from across *Balloki.* The *Upper Bari Doab Canal,* which now lies mainly in India, and takes its rise at *Madhopur,* gives its tail-end waters to the Lower Bari Doab Canal. The dispute about the sharing of these waters between Pakistan and India has yet to be settled. The Lower Bari Doab Canal irrigates the District of Montgomery and part of Multan. The longest single canal is formed by the Upper Chenab Canal from Merala to the southern tip of the Lower Bari Doab Canal, the length being 263 miles.

Sutlej Canal takes out from the *Gandasingh Wala* head-works near Ferozepore. A canal taken out from here on the west bank irrigates a portion of the Bari Doab. The canals on the east of Sutlej lie in India.

Dipalpur Canal takes out from the west bank of Sutlej at *Sulemanke* head-works on the border. The canal and the head-

works are completely on the Pakistan side of the border, but it is possible for India to extract the waters of Sutlej at Rupar and Gandasingh Wala above Sulemanke, and also at Bhakra and Nangal, after these projects are completed. It is contended that this leaves very little water for Dipalpur Canal. The dispute over the sharing of the waters of Sutlej between Pakistan and India is still pending. The Dipalpur Canal irrigates the *Nilibar Colony,* which was a desert waste, before the digging of the canal.

Thal Project. This project envisages the irrigation of the Sind Sagar Doab lying between the Indus and the Jhelum, covering the districts of Shahpur, Mianwali and Muzaffargarh. The head-works will be at *Kalabagh.* Preliminary work, started on the project in 1939, was suspended in 1942. It has been actively revived in 1947. The project will bring under cultivation 7,00,000 acres of land by 1954, which will yield 2,00,000 tons of food grains, 9,000 tons of sugarcane and 23,000 bales of cotton. The cost of the project is estimated at Rs. 10 crores. A Thal Development Authority on the lines of the well known T. V. A. (Tennessee Valley Authority) of U. S. A. has been created to expedite the work.*

Rasul Tube-well Project. This project envisages the sinking of nearly 2,000 tube-wells along the main canals of the Jech and Rechna Doabs. They will raise 3,600 cusecs of subsoil water back into the canals. They will also reclaim water-logged areas. The scheme will cost 4.4 crores of rupees.

Irrigation Works of Sind

Irrigation has changed the desert lands of Sind into a fertile and rich agricultural country. It now produces wheat, cotton, sugarcane and rice.

Sukkur Barrage is a big 4725 feet long dam across the Indus near Sukkur which impounds a huge lake behind it, which supplies water to the canal systems below it. The total area irrigated by them is six million acres. A further three million acres of waste land has been brought under cultivation by increase in humidity and rise of the water-table. On the right (west) bank the canals

*Pakistan Development Schemes. Ministry of Economic Affairs, Government of Pakistan.

are the *Kirthar Canal,* the *N. W. Canal,* the *N. E. Canal* and the *Central Rice Canal.* The irrigation spreads westwards to the edge of the high ground at the foot of the Kirthar Range. On the left (east) bank the canals are the *Khairpur Canal,* the *Rohri Canal* and the *Eastern Nara Canal.* The last has been excavated along the dried up bed of Nara, a former distributary of Indus. The area irrigated by it lies to the south-east. Rohri Canal spreads south-wards past Hyderabad. The *Khairpur Canal* consists of two branches running very near the bank of Indus in the upper portion of the irrigated region.

A new project has been launched to increase the irrigated lands of Sind by building two barrages on Indus. The *Lower Sind Barrage Scheme* will irrigate areas south of the present irrigated block. The *Upper Sind Barrage Scheme,* will increase the capacity of the present Sukkur Barrage and also irrigate more area to the north.

Irrigation in N. W. F. P.

Here the rainfall is so little that agriculture is impossible without irrigation. But there are only few small irrigation works. The Kabul, Kohat and Bannu valleys are irrigated by wells mainly. Along the Indus inundation canals irrigate a strip along the river. A number of small irrigation schemes are given below.

Kheshki Lift Irrigation. This will irrigate 12,000 acres between Risalpur and Kheshki by lift irrigation from the Kabul river. Electric power driven pumps will be used for this purpose.

Maqam Nullah Lift Irrigation. This will irrigate 2,000 acres near Mardan raising water from Maqam Nullah by irrigation.

Mama Khel Jadid Canal Extension. This will increase the area irrigated at present in Bannu.

Kurramgarhi Weir. Under this sceme a weir will be built across river Kurram at Kurramgarhi. It is expected to improve the irrigation of 1,33,000 acres of land and also bring an additional acreage of 1,20,000 under cultivation, which will produce 40,000 tons of food grains per year. Some Waziri tribes may be settled in these lands.

Rod-Kohi Scheme will utilize the waters of hill torrents in Dera Ismail Khan for irrigation by constructing a few spill weirs for storage of water.

Kohat Tube-well Scheme envisages the construction of 50 electric tube-wells, using power from the Malakand hydro-electric station. It will irrigate 20,000 acres and produce 7,000 tons of food grains annually.

Warsak Project. This is a multipurpose project on the Kabul river. It will irrigate 60,000 acres of land.

Irrigation in Baluchistan

Here the usual method of irrigation is by *Karez* or underground water channels. This is done to avoid loss by evaporation in the hot and dry climate. Annual rainfall is hardly six inches in the year, and so cultivation depends only upon the small irrigation works dependent upon the meagre water in the streams. The following new irrigation schemes may be noted:—

Anambar Weir. This project, now completed irrigates 6,000 acres by water taken from the Anambar river.

Narachi Irrigation Scheme will irrigate 3,200 acres of land in Loralai and will yield 1,000 tons of food grains per year.

Zargi-Tangi Irrigation Scheme is expected to irrigate about 1,000 acres in Sibi, 55 miles south of Quetta.*

Irrigation in East Pakistan is negligible, there being a few small irrigation canals. Here drainage channels and bunds to save crops from being destroyed by floods are much more important.

Provincial distribution of area under canal irrigation, together with the total sown area in thousand acres is given below:—

Province	*Total area sown*	*Area irrigated by Canals.*
Punjab	 15,000	 7,000
Sind	 5,600	 4,000
N. W. F. P.	 2,400	 400

Area irrigated by canals in Baluchistan and East Bengal is very small.

* Pakistan Development Schemes, Govt. of Pakistan publication.

Hydro-electric Power

The coal and mineral oil resources of Pakistan are poor. The coals are poor in quality and found in small scattered pockets. Production of mineral oil in Punjab meets only a very small proportion of the needs of Pakistan. Hence the development of hydroelectric power is very urgently needed. West Pakistan which has a rugged topography in the north and west suitable for hydel power development. has a very low amount of rainfall, and so a low potential. E. Pakistan has a heavy rainfall but a flat topography which goes against hydel power production. Only Chittagang hills here are suited for this purpose. Thus Pakistan's potential for hydel power development is not very high. She has only one working plant at present in Malakand in N. W. F. P. This and other projects are discussed below.

Malakand project and extension scheme. The present hydroelectric plant is near Malakand at Jobban on river Swat, a tributary of river Kabul. The installation of three sets totalling 9,600 kw utilizes a natural head of 250 feet. Two more sets producing 10,000 kw are being installed, and will be ready by the end of 1950. The total capacity of the plant will then rise to 19,600 kw. Four miles down stream at Dargai another head of 250 feet is available. It is proposed to instal 4 sets here producing 20,000 kw, raising the total to nearly 40,000 kw.

Warsak multipurpose project. It envisages the construction of a large dam on the Kabul river above Jamrud. 60,000 to 100,000 kw of electric power will be generated and 60,000 acres of land will be irrigated. The navigability of the Kabul river will be increased by the regulation of flow. The power will be utilized to work coal, gypsum, copper and marble mines in the neighbourhood. The cost of the project will be Rs. 9.5 crores, and it will take five years to complete. Preliminary work consisting of the drilling of rocks to find a suitable site has begun.

Mianwali Hydroelectric Scheme envisages the utilization of a 40 feet fall in the Thal Canal to be taken out of Indus in Punjab. It will give 21,500 k w of power. The cost will be Rs. 4.5 crores. The work will be completed in 3 to 4 years.

Rasul Hydro-electric Project. A head of 86 feet is available near Rasul between the Upper Jhelum Canal and Lower Jhelum

Canal in Gujrat in Punjab. This will be utilized by the project to produce 14,000 k w of power. Work began on the project in 1945 and will be completed in 1952.

Karnaphuli Multi-purpose Project. The catchment of Karnaphuli receives over 100 inches of rainfall every year. The rough topography is also very favourable for the production of water power. The project envisages the production of 40,000 kw of electric power. By regulating the flow of water the river will become navigable for fifty miles between Chittagong and Rangamati. The possibility of floods, which are often disastrous, will be also reduced. Preliminary work on the scheme started in 1947. Geological and hydrological studies have been initiated. An aerial contour survey is also under preparation. Investigations of the different sites for the construction of a dam have also been taken up. The power produced will be utilized for developing industry near the port of Chittagong, where plans are in progress for erecting jute, paper and cotton mills. The cost of the project will be Rs. 5 crores, and the time required for completion about four years.

Agriculture

Pakistan today, is essentially an agricultural country. The economy of the country is primarily agricultural, for besides selling jute and cotton, her two great cash crops, she has also a surplus of food grains, which she can export. The money thus obtained enables her to buy manufactured goods, coal and metal goods in which she is deficient. Four-fifth of her population is engaged in agriculture. The following table gives land-use statistics in million acres for provinces, for 1946-47:—

	(Cultivated)		(Uncultivated)	
Province	*Net area actually sown*	*Current fallow*	*Cultivable waste other than fallow*	*Not available for cultivation*
Punjab	15	2	8	7
Sind	6	5	6	14
N. W. F. P.	2	1	3	3
Baluchistan	3	2	3	1
East Bengal	18	3	4	6
Total	44	13	24	31

Thus while the area under cultivation is 44 m acres, there are 24 m acres of cultivable waste. Plans are being prepared to bring under cultivation 8 million acres out of this.*

Conditions of agriculture are backward. Holdings are small and scattered. The farmers are poor and so unable to use enough of fertilizers, improved seeds or modern implements. The young Government is, however, trying hard to make up these defficiencies.

Agricultural education and research continues in institutions at Dacca in E. Bengal, Lyallpur in Punjab, Mardan in N. W. F. P., Quetta in Baluchistan and Sakrand (to be shifted to Hyderabad) in Sind. Research on sugarcane is now being carried out at the newly established Sugarcane Research Station at Mardan. Research on temperate fruit is being carried out at Quetta. New varieties of cherries, apricots, peaches, pears, grapes, plums and apples have been introduced. A fight against insects which damage or kill plants, fruits and seeds continues. A new mycological herbarium is to be established. Diseases like Dying Bich, Bunt, Smut and Broomrope are being studied. Control of pests like the block-headed cricket, codling moth and rice stem borer is being planned. Efforts are not lacking in keeping the Pak-American varieties of cotton pure, and not get mixed up with inferior types.

Improved seeds are being produced and distributed. A scheme has been drawn up to provide for the distribution of improved seeds of wheat, rice, jowar, potatoes, maize and vegetables in Baluchistan. Seed multiplication farms have been set up at Quetta, Loralai and Sibi Jadid. Improved varieties of jute are being introduced in E. Bengal.

Fertilizers are being used in increasing quantities. In E. Bengal a scheme has been sponsored for subsidizing the supply of manures to farmers in eight lakh acres of land. A 50% subsidy is given for the use of ammonium sulphate in Sind at the rate of 1 cwt. per acre of paddy and 2 cwt. per acre of cotton.

Mechanised Cultivation is being introduced. E. Bengal Government is to buy 100 tractors per year for five years, which

* Pakistan, issued by the Embassy of Pakistan, Washington, U. S. A.

will be hired out to farmers. At the end of five years 75,000 acres of land will be ploughed by these tractors yielding 33,000 tons of rice per year. Mechanical cultivation is also being sponsored in Baluchistan to bring new areas under cultivation by terracing and bunding. 1,000 acres of rice land were ploughed by mechanical means.

Food grains occupy nearly 38 million acres of land in Pakistan. The two main cereals are wheat and rice. The two great cash crops are jute and cotton. Millets, sugarcane, oil-seeds and tea are other leading crops. The following table gives the production in 1,000 metric tons for some post-war years, compared to the pre-war average of the five year period of 1934-38.*

	1934-38 Average	*1946*	*1947*
Rice	11,168	12,822	11,819
Wheat	3,183	3,320	—
Bajra	—	514	—
Jowar	—	224	—
Maize	364	435	—
Barley	153	164	—
Gram	—	626	—
Sugarcane	650	865	902
Rape seed	232	208	215
Sesamum	43	37	37
Cotton seed	578	515	—
Linseed	15	12	11
Cotton	289	258	—
Jute	—	749	1,242
Tea	25	18	—
Tobacco	151	91	—

The table shows the great importance of rice, wheat, cotton and jute to Pakistan. Leading crops are discussed in greater detail in what follows.

*Year book of Food and Agricultural Statistics, Volume I, by F. A. O., 1948. Note that all the figures are in 1000 metric tons including those of cotton, jute, tea and tobacco.

Rice

This is the leading grain crop of E. Bengal, but good quality rice also grows in W. Pakistan, specially in the Indus delta in Sind. But of the 8.2 million tons of rice of Pakistan 7 million tons is produced in E. Bengal. Nearly one million tons of rice is produced in Sind and the remainder in Punjab and N. W. F. P. However, the density of population in E. Bengal is so great that Sind rice has to be sent to E. Bengal.

The soil of E. Bengal is rich, fresh alluvium. Rainfall is enough. Many areas give a double crop. The early summer crop called "Aus" is of a rough variety. The main crop is "Aman". It is generally transplanted from a nursery in the first month of the monsoon, after a very careful preparation of the field. Harvesting is done in early winter. Another crop called "Boro" is grown in low lands and around bils (shallow lakes) in late winter or spring, being harvested in April. It is also of a rough variety. There are many varieties of rice in E. Bengal, some of them being of a very good quality.

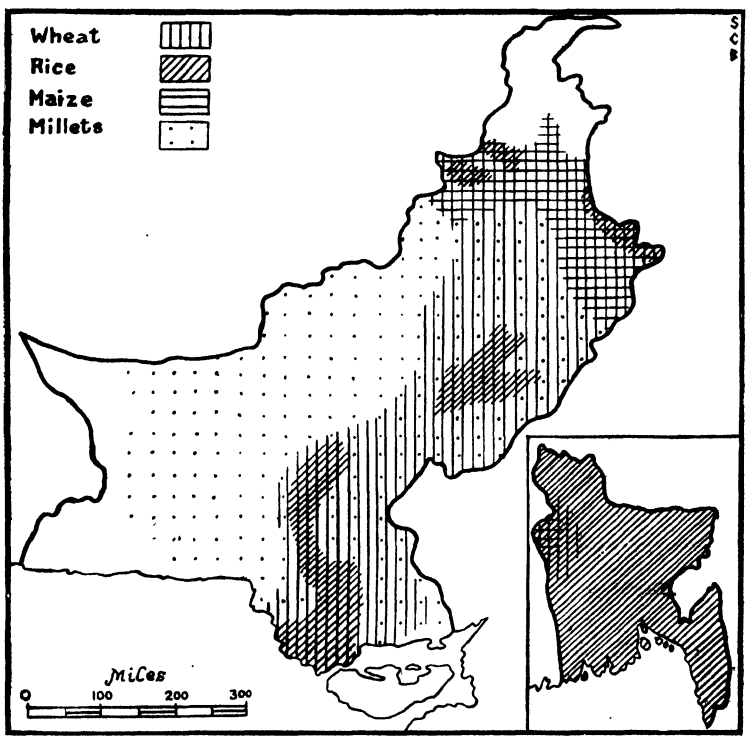
Rice is grown in W. Pakistan wholly by irrigation. The Sind delta and the western part of the irrigated region of Sind around Dadu grows good quality rice. In Punjab rice grows at the tail ends of the canal colonies, where water accumulates. In Kabul valley around Peshawar a very high quality table rice is grown. Rice occupies nearly 23 million acres of land.

Wheat

Wheat is the leading cereal of W. Pakistan. It occupies 7 million acres of land in Punjab, 1.2 m acres in Sind, 1.1 in N. W. F. P. and .8 in Baluchistan.

It grows in fertile alluvial loams in Punjab. Lyallpur is a great wheat producing centre. Here research on improved seeds is carried out. Many wheat fields have a double crop, the other crop being a millet grown in summer. Punjab had a bumper wheat crop in 1949-50 and declared a surplus of 100,000 tons. Wheat is sown in autumn or early winter and harvested in early summer. In N. W. F. P. wheat is grown in the irrigated valleys of Kabul and Kurram. Wheat also grows throughout Sind in the region covered by irrigation. The

population of Pakistan is 22% of the population of India before partition, but her food grain production is 30% of the same. So Pakistan is a surplus country in food. But as E. Bengal is a deficit area, W. Pakistan is even a bigger surplus area, and wheat is the surplus grain. W. Pakistan exports wheat to E. Pakistan and other foreign lands. She can easily export it to India, if some artificial trade barrier is not created. In 1950



Map 67
Food Grains.

negotiations were going on between the two countries, but the price demanded by Pakistan was considered too high by India. 250,000 tons of wheat was exported to W. Germany in 1950.

In the canal irrigated areas, a great menace is the water-logging and the resulting incrustation of salt. In this manner nearly 2 m acres of good wheat land have gone out of cultivation.

Efforts are being made to check this loss of land and reclaim the saline lands. But it is still a loosing game. Effective methods will have to be devised to save the wheat lands from ruin.

Bajra is the most important millet of W. Pakistan. It covers 2.5 million acres. It is a kharif crop and grows in the poorest soils. It is consumed locally by farmers. *Jowar* occupies 1.2 m acres and also grows as a kharif crop in W. Pakistan. Jowar and bajra often grow together. *Barley* occupies only half million acres of land and is not an important crop. *Maize* grows as a secondary early monsoon crop in Punjab, N. W. F. P., Sind, north-west part of E. Bengal and Chittagong Hills. But the greatest concentration is found in the hills of Abbotabad in N. W. F. P. The quality of maize is also good in the cool hills of Punjab and N. W. F. P.

Various kinds of pulses are grown both in East and West Pakistan. *Gram* is a very important crop in W. Pakistan where it occupies nearly three million acres. It is a winter (rabi) crop. Gram and pulses are leguminous and so they make the soil rich in nitrogen, and thus help maintain its fertility.

Rape and Mustard are the chief oil seeds of Pakistan. Linseed, groundnut and sesamum are also grown to some extent. Total production of oil seeds was 245,000 tons in 1946-47. Of this 112,000 tons was produced in E. Bengal, 77,000 in Punjab, 45,000 tons in Sind and the rest in N. W. F. P. and Baluchistan.

Sugarcane

This crop covers an area of 600,000 acres. Some sugarcane is cultivated in nearly the whole of E. Bengal, Punjab, Sind and the valley lands of N. W. F. P. But the greatest concentration is in the Kabul and Swat valleys in N. W. F. P. Other areas are Gujrat, Sialkot, Lahore, Gujranwala, Shekhupura, Lyallpur and Montgomery in Punjab, and Dinajpur, Rangpur, Bogra, Dacca and Barisal in E. Bengal. In 1949, there were 350,000 acres of land under sugarcane in Punjab, against 316,000 in 1948. Though the production of cane is enough, and its quality is good, there are only 11 sugar factories. So Pakistan has to import mill-made sugar. A new factory has been just completed in Mardan.

Tea

The tea gardens of Pakistan are concentrated in the Sylhet district in E. Bengal, a few being in the Chittagong Hills. Acreage of tea in 1946-47 was 80,000 acres and production 55 m lbs. Besides supplying local needs, some tea is exported, mainly to U. K. Sylhet tea gardens are mainly owned by the British. A great scope for the expansion of tea cultivation exists in Chittagong Hills. Pakistani as well as some Assam tea is exported through the port of Chittagong, which is much congested and needs development.

Tobacco

The area under tobacco in 1947-48 was 330,000 acres and the production 150,000 tons. The chief tobacco growing region is Rangpur in E. Bengal, where it is an important crop. Tobacco grows also in Dinajpur and Chittagong Hills. Tobacco is also an important crop in the Kabul valley in N. W. F. P. Some tobacco is grown in Sialkot and Gujrat districts. The tobacco grown is generally of an inferior quality, and is used for hubble-bubbles, biris, zarda and chewing.

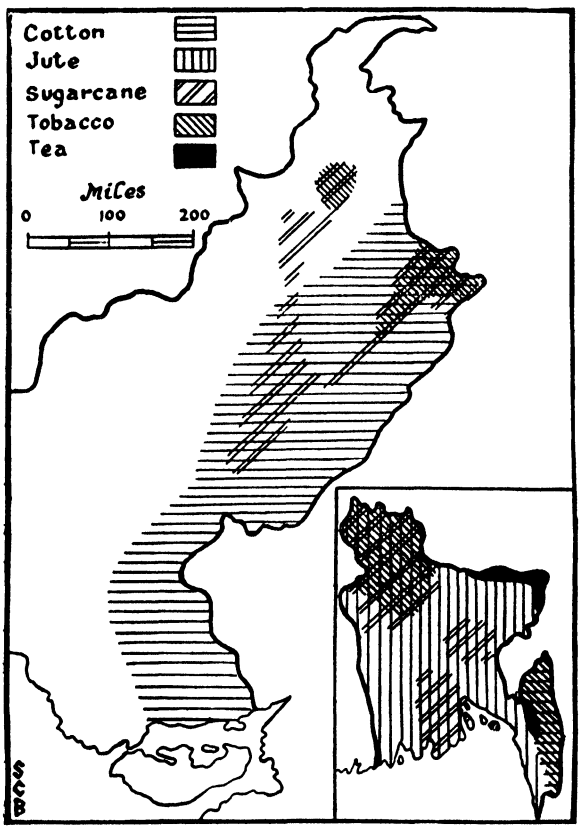
Spices

The most important spices grown in Pakistan are ginger, turmeric and chillies. They grow in E. Bengal specially and also in Punjab and N. W. F. P. There is a great local market for these spices. Ginger is exported from E. Bengal.

Jute

This is a very important fibre of Pakistan and wholly grows in E. Bengal. It is a great earner of foreign exchange, and upon its production and price depends the prosperity of the East Bengal farmer. Jute cultivation has, however, been passing through a crisis. There is no jute mill in E. Bengal, though plans are ahead for constructing three mills. Jute manufacture is concentrated near Calcutta in India. So the most important customer of Pakistani raw jute is India. Foreign countries are mainly interested in buying manufactured jute. Only the United Kingdom has some jute mills which consume raw jute. Relations between India and Pakistan have not,

however, been good enough for a smooth trade of raw jute. Devaluation of the Indian rupee has further complicated matters. On the other hand India has rapidly increased her jute acreage, and may soon become independent of Pakistani jute. Jute production and prices have, therefore, fallen to the detriment of the jute grower of East Bengal.



Map 68
Fibres and other crops.

Area under jute in 1947-48 was 2,059,000 acres, and production was 6.8 m bales. The normal export of jute is considered to be 5 m bales to India, 1 m bales to Dundee (U. K.) and 1.5 m bales to the rest of the world. In 1948-49 the acreage of

jute fell to 1,877,000 and production to 5.5 m bales. India imported 4.2 m bales from Pakistan in this year. In 1949-50 the acreage had fallen further to 1,561,000 acres and production to 3.3 m bales. The large decrease in area and yield was also due to heavy rains and hail-storms in April 1949. In 1950 it was decided to reduce the acreage of jute in 1950-51 by another 30%, and to concentrate on finer varieties of the fibre, as it was thought that India would further curtail her jute import, which was generally of an inferior variety.

Jute is a summer monsoon crop. It grows to a height of ten or more feet. It is grown all over E. Bengal, but the greatest concentration is in Mymensingh which grows nearly a quarter of the total.

Cotton

This is another big money earner of Pakistan, and grows mainly in W. Pakistan. As Pakistan has 14 cotton textile mills some of this fibre is consumed at home, unlike jute. Another difference from jute is that there is a big world market for good quality raw cotton, but there is a limited world market for raw jute (except in India), the main world demand being for manufactured jute. Hence there are no difficuties for disposing raw cotton. India needs the cotton of Pakistan for her rising textile industry, but for this amicable trade relations are needed, which unfortunately do not exist.

Total acreage under cotton in 1946-47 was 3.5 m acres and production 1.5 m bales (of 400 lbs each). Of this 1.3 m bales were exported to Europe, U. S. A., and China.*

More than half of Pakistan's cotton grows in Punjab, where in 1949 the area under cotton was 1,613,000 acres of which 1,486,000 was of the long staple American type. The yield in this year was 733,200 bales of which 691,700 bales were of the American type. The greatest concentration of cotton is found in the Montgomery and Multan Districts.

In Sind the acreage under cotton is about 900,000 acres and outturn 400,000 bales, 90% of it being the American type.

* Economic Progress of Pakistan, 1947-48. Publicity Dep. Govt. of Pakistan.

More cotton grows in the eastern part of Sind. Here condition are in some respects similar to Egypt, for if Egypt is the gift of Nile, Sind is the gift of Indus. The desert soil which was virgin before irrigation started, and the bright desert sun make the cotton long, lustrous and white. Water supply can be controlled at will, being supplied by irrigation. Insects injurious to cotton cannot survive in the desert climate. Finally there is an unlimited fine season for plucking.

Some good quality cotton is grown in the valleys of N. W. F. P. An inferior variety grows in Chittagong Hills and the northern borders of Sylhet and Mymensingh. It is used locally for hand-spun and woven cloth.

Great care has to be taken to keep the good qualities of cotton pure, for a cross-pollination from an adjecent field with low-grade desi cotton will damage the purity of the next seed. Inspite of all efforts the quality gradually deteriorates and fresh seeds have to be imported now and then.

Horticulture

Pakistan is a big producer of fruits, both in quantity, variety and quality. While the hills of N. W. F. P. and Baluchistan produce temperate fruit, East Bengal excels in the production of high quality plains fruit .

Baluchistan has been called the garden of Pakistan. Its grapes are of the highest quality. It also produces apples, pears, plums, peaches, apricots, cherries and pomegranates. Other fruits are melons, dates, figs, nectarines and quinces. Nearly 5,000 acres of land is under orchards. A horticultural scheme has been drawn up to raise fruits here on most scientific lines by raising high quality nursery plants, introduction of proper methods of pruning, training, thinning etc., and taking up research work in fruit culture and eradication of pests. A fruit experimental farm has been set up at Quetta.

N. W. F. P. has about 1,500 acres under fruit orchards of the same kinds as in Baluchistan. Almonds and walnuts are also produced here besides peaches, apricots and figs.

Punjab has her hill fruit orchards in Murree hills. Melons, mangoes, figs, mulberries, dates and citrus fruits grow in the plains.

Sind produces dates in large quantities.

E. Bengal has nearly 200,000 acres of land under fruit trees. Mangoes, bananas, jack fruit, lichis and many other kinds of fruit grow all over the country. Oranges and pineapples grow in Sylhet.

Animal Products

The animal population of Pakistan in thousands for 1949 was:—*

Cattle and buffaloes	29,896
Sheep and goats	16,212
Horses, mules and donkeys	1,424
Camels	454

The table shows that the greatest animal wealth of Pakistan is in her cattle. Though the number of cattle in E. Bengal is high, they are generally unhealthy and give a small yield of milk per head. As in India the consumption of milk and dairy products is very low per capita. There is no modern dairying industry worth the name. West Punjab has a number of breeds of high yielding milch cattle—cows and buffaloes. Their breeding in large numbers and distribution is being undertaken. Sind rears some of the finest breeds of milch cows, the *Red Sindhis* having acquired international fame, for their being taken to Florida, U. S. A., where they have produced hardy mixed breeds, and which have again been brought back to Pakistan and India.

Two other well known breeds are *Sahiwal* cows and *Nili* she-buffaloes. *Dhanni* bullocks are good for work in fields. *Tharparkar* cattle are good for work as well as milk yield. The total production of milk in Pakistan is 156 million maunds.

Goats are found all over Pakistan and supply meat and good quality skins. Some goat milk is also consumed. *Dehra Deen Panap* breed of goats is noted for heavy milk yield.

Sheep are found specially in W. Pakistan. Besides giving meet they give wool. N. W. F. P. where the best quality of

* Three years of Pakistan. Pakistan Govt. Publication.

wool is obtained have sponsored a scheme to improve the quality of wool and grade it properly. Shearing and washing of wool on scientific lines is to be introduced. There is one woollen mill in Punjab and another in E. Bengal. Good quality wool is also produced in Baluchistan and Sind. Pakistan produces about 26.5 m lbs. of wool every year.

The total annual production of hides and skins is 14,616,000 pieces. Annual production of meet is 8,816,000 maunds, bones 3,261,000 maunds and guts 8,542,000 pieces.

Camels are found only in W. Pakistan, where they are used for transport. They pull camel carts all over this region. They also supply camel wool which is used for making felts and rough blankets. The one-humped camel of Sind is a very sturdy and useful animal.

Some famous breeds of horses are found in W. Pakistan. They are unimportant in E. Bengal. Punjab has the famous breeds of *Baluch* and *Dhani*. The stocks have been improved by the utilization of Arab and English thorough bred stallions. Baluchistan is famous for horses. An execptionally fine breed comes from *Barkhan*.*

The Government of Pakistan is alive to the needs of putting animal husbandry on scientific lines. An Animal Husbandry Research Institute has been started in Peshawar in 1949, with a branch in Comilla. It is now producing vaccines and sera to fight animal diseases. Steps have also been taken to improve flaying, curing and marketing of hides and skins in N. W. F. P. Experts have been appointed for this purpose.

Fisheries

East Bengal has rich resources of riverine and esturian fish. The large swamps and bils of the delta are ideal grounds of fish culture. Here *Carps* grow to big sizes. The rivers abound in numerous varieties of fish of which *hilsa* which ascend up the river during the monsoon give a great harvest of fish. *Lobsters* also are caught in large numbers during this period. Fish forms an important part of the diet in E. Bengal. The quantity of

* The Land of Pakistan. Publicity Dep., Govt. of Pakistan.

fish landed is about one m tons and a large surplus for export is available.** This in natural course comes to the Calcutta market. Due to strained relations off and on between India and Pakistan, the trade in fish has not run smoothly as before. Easy and quick transport and a copious supply of ice for preservation is needed for fish trade. Ice factories at river ports where fish is landed from boats had to stop work now and then due to lack of coal. Trade in fish, if smoothly carried out, will be to the advantage of the consumers of W. Bengal in general and Calcutta in particular, where fish will be available at cheap prices. On the other hand it will give money to thousands of fishermen of E. Bengal. A scheme has been sponsored for reclaiming derilict water areas of Chittagong, Jessore and Dinajpur at a cost of Rs. 3,19,000. It will yield 12,000 maunds of fresh fish every year, after its completion in 10 years.

The 530 miles long sea coast in Sind and Baluchistan is important for coastal fishing. It is still carried out by primitive methods by local fisherman. A motor trawler named *Ala* is doing important survey work since 1948. A new fish harbour is being constructed at West Wharf in the port of Karachi for accomodating fishing boats and trawlers. The present fish harbour is at Juna Bunder. About 35,000 people are employed in fishing in Sind and the total catch is 20,000 tons of fish every year. Fresh fish is caught in Sind in Manchar Lake and other lakes and rivers, amounting to 9,000 tons per year.

Punjab has only riverine fisheries. The large rivers contain carps and mahseer. Fish is not an important part of the diet in Punjab.

In N. W. F. P. trout is found in some hill streams in Kaghan valley in Hazara. They have yet to be developed. Fish is also caught in Kabul river. The reservoir formed by the Warsak dam will provide for rearing fish.

The total production of fish in Pakistan is two m tons per year. Besides exporting fresh fish to India, Pakistan exports 4,000 tons of cured fish to India, Burma and Ceylon annually. It also exports 10,000 tons of manure. A shark liver oil factory produced 10,000 gallons of oil in 1949.

** East Pakistan, Third year of independence.

Mineral Resources

In mineral resources Pakistan is not in a happy position. This is specially so in the case of power production. All the major coal-fields of pre-partition India lie in India at present. Of mineral oil the smaller of the two major oil fields, namely that in north Punjab has fallen to the share of Pakistan. Water-power resources have been discussed previously.

In metals, the present production of Pakistan is meagre. All the large iron-ore deposits of the Indo-Pakistan subcontinent lie in India. Rock salt, gypsum, chromite and sulphur are the only minerals in which the production of Pakistan is greater than that of India. But various kinds of minerals including coal, oil, copper, gold, iron and antimony are known to occur in Pakistan at various places. They have only to be tested further to find out if their economic exploitation is feasible.

*Coal** is worked in the *Salt Range* in Dandot coalfield in Punjab and *Khost* and *Mach* in Baluchistan. The total production is 500,000 tons annually. It is tertiary coal of an inferior type, containing 30 to 40% of carbon. It often becomes brittle when exposed to air. Specially devised furnaces may use this coal. It can also be used for reducing limestone to quicklime. Two briquetting plants of 20-25 tons capacity are to be set up by the Government in Punjab and Baluchistan to make this coal more useful. Coal deposits also occur along the Daur river in Hazara, in the Cherat Hills near Peshawar, in Kohat, near Mira Kwand (lignite) in S. Waziristan, beyond Pir Karal north-west of Kaniguram and in Chittagong.

Production and resources of coal are on the whole poor and can only meat a fraction of the needs of the country.

*Mineral Oil.*** The productive oil fields are in the northern corner of Punjab at *Khaur, Dhulian, Joya Mair* and *Balkassar.* They produced 425,553 barrels of crude oil in 1948 and 823,550 barrels in 1949. The increased production was mainly from the new field at Balkassar.

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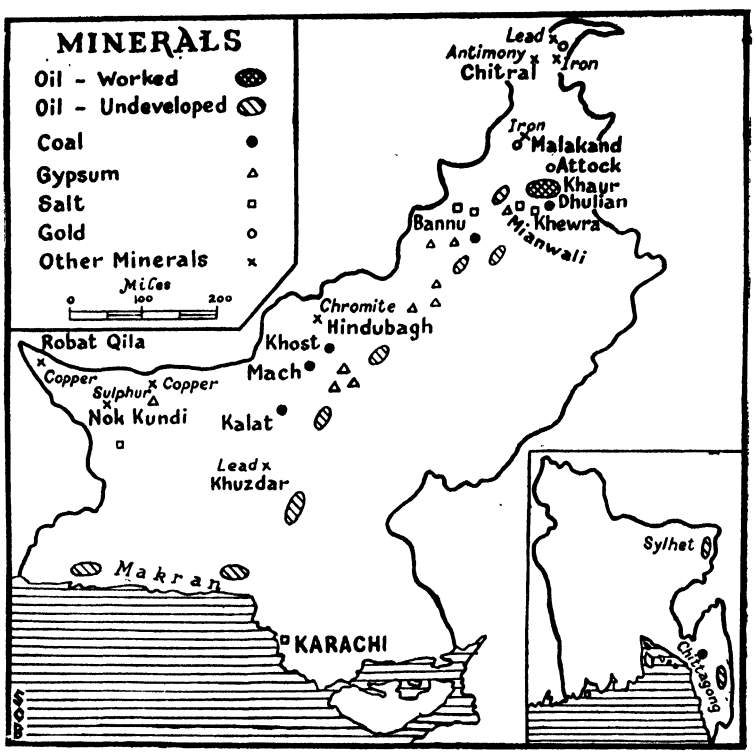
*The Mineral resources of North-Western India. E. R. Gee. Transactions of the National Institute of Sciences of India, Vol. II, No. 8.

**Three years of Pakistan. Pakistan Government Publication.

Prospecting for oil in new areas continues. A test well at Lakhra, after reaching a depth of 12,666 feet had to be abandoned. There are prospects of finding oil in Makran in the flanks of Kirthar range, in the foot hills west of Indus and along the eastern border of Sylhet in E. Bengal.

Chromite is worked in *Hindubagh* in Baluchistan in the Zhob valley. It is a high grade ore with 50% chromium oxide.



Map 69
Mineral Resources.

Production in pre-war years was 12,000 tons on the average. The output fell after this, but rose to 15,673 tons in 1949.

High grade chromite ore is also found in other parts of Zhob valley and in Upper Pishin. At Khanzai a mass of pure chromite 400 feet long and 5 feet broad has been noticed. It also occurs in N. Waziristan and Chitral.

Salt. Pakistan is an important producer of salt. It is of two types.

Rock Salt is produced at *Khewra* in the Salt Range in Punjab. Here galleries run into a mass of rock salt, the floor, the roof and the walls being all made of salt, presenting a wonderful sight. Salt is also mined at *Kalabagh* and *Warcha.* Total production of rock salt in 1949 was 174,000 tons. *Potassium salts* are also found in these mines but are not worked. They will prove useful for making fertilizers, gunpowder and other chemicals.

Sea Salt is manufactured by solar evaporation at *Mauripur,* near Karachi, the production being 200,000 tons per year. There are huge deposits of salt in Thar Parkar in Sind. They have yet to be exploited.

Sodium salts and soda (Kharo Chaniho) are extracted from the soil in Khairpur, Sind, some 2,500 tons being produced every year. They are used for soap-making and washing.

Mineral water springs with healing properties are found at *Mangho Pir* near Karachi and *Laki* near Kotri. They can be developed into spas.

Gypsum occurs widely in W. Pakistan. Production in 1949 was about 16,000 tons. Now it is mainly used in cement manufacture. It could, however, be utilized for the manufacture of fertilizers. Erection of a 50,000 ton fertilizer plant is under consideration of the government. Gypsum is also used for making plaster of Paris. Gypsum is found in Sibi, Harnai, Bannu, Kohat, Dera Ismail Khan and the Salt Range.

Sulphur occurs in *Koh-i-Sultan* and *Sanni* in Baluchistan and *Chitral* and *Mardan* in N. W. F. P. There are 200,000 tons of estimated reserves. Between 1941 and 1944, when supplies from outside were cut off, 66,300 tons of sulphur ore were extracted from Koh-i-Sultan. The quality of sulphur ore being not good, it cannot compete with imported American sulphur. For strategic reasons, however, it has been decided to work the deposits. Sulphur is used in the manufacture of sulphuric acid, gunpowder, matches and sugar.

Glass Sand is found at *Jungshahi* and *Dadu* in Sind, *Mianwali* (Trans-Indus Salt Range) and *Basharat* in Punjab

and *Paniala* in N. W. F. P. Production of glass bottles started in Jhelum in 1892, but it has not developed much. Raw material being available, and there being a great internal demand, efforts are being made to start a modern glass industry. Reserves of glass sand are about 320,000 tons.

Limestone of good quality occurs widely in Sind and Baluchistan from near the sea coast to Takht-i-Sulaiman in the Kirthar and Sulaiman ranges and in Kalat and Loralai. It is also found abundantly in the Salt Ranges in Punjab and in and along the northern borders of Sylhet in E. Bengal. At present it is exploited for supplying building stone and the manufacture of lime and cement.

Fireclay is found in *Paniala* (N. W. F. P.) *Ochre* is found in *Gaj* in Sind. Other coloured clays are found in *Laki Range* in Sind.

Marble of good quality is obtained from *Mullagori* mines near Peshawar. Excellent statuary marble occurs in *Shahimena* (N. W. F. P.)

Iron. The known reserves of iron ore in Pakistan are poor. The quality of the ore is not good and it is being worked no where. Iron ore occurs in the Panjkora valley, Bannu, Chitral and at Tatta near Karachi.

Gold occurs in gravel deposits in old river terraces in the Indus valley near Attock, in Jhelum district and in Mardan and Hazara. At present the villagers extract only a few ounces a year by gold washing.

Copper ore is found in Ras Koh Range in the north-west of Baluchistan, in the Lorai Pass in Chitral and in the Mohmand territory in N. Waziristan. It has yet to be determined wheather it can be exploited on an economic scale.

Antimony is found in *Chitral* in N. W. F. P. and *Sakrand* in Kalat in Baluchistan. The deposits which may be used for manufacturing lead bullets, shells, smoke bombs and pipes, have not yet been exploited.

Industrial Development

Partition of India was unfavourable to Pakistan so far as industries are concerned. Pakistan got 1,200 industrial establishment as compared to 11,500 acquired by India, so that the share

of Pakistan was 9.5% and that of India 90.5%. Considering the number of persons employed in industry Pakistan had 250,000 and India 2,652,,000 persons. This came to 7.3% for Pakistan and 92.7% for India. Regarding various industrial groups the position is given in the following table.

	Pakistan		*India*	
Industrial Group	*Persons employed in ,000.*	*Percentage of total*	*Persons employed in ,000.*	*Percentage of total*
Textiles	32	2.7	1,156	97.3
Engineering	46	10.7	264	89.3
Minerals and Metals	8	7.8	92	92.2
Food and drink	24	6.9	327	93.1
Chemicals	4	4.0	94	96.0
Paper and Printing	4	5.9	64	94.1
Wood, Glass, Stone	8	6.7	117	93.3
Hides and Skins	3	8.8	31	91.2
Gins and Presses	47	24.7	148	75.3

The table shows that execpt gins and presses Pakistan had a poor share. Post-partition communal disturbances also were bad for her industry for Hindu and Sikh technical personel fled from W. Pakistan. The chemical works at Khewra closed down from this cause, and many small engineering industries suffered the same fate.

The composition of the industrial groups after partion in Pakistan is given below as percentages of various groups to total industry.

Gins and Press	....	23.3	Minerals, Metals	....	4.2
Engineering	....	22.8	Chemicals	....	2.4
Textiles	....	16.0	Paper, Printing	....	2.4
Food and Drink	....	12.1	Hides, Skins	....	1.9
Wood, Glass, Stone	....	4.4	Miscellaneous	....	10.5

Causes of the backwardness of Pakistan in industry are given below:—

(a) *Peripheral position.* Industry develops in the central parts of a country to help assemble raw materials and distribute products easily to surrounding markets. Industrial centres like

Kanpur, Jubbulpore, Nagpur etc. grew up in the central parts of undivided India.

(b) *Lack of central ports.* Industry grew up in ports depending on imports of machinery from abroad. The two ports of Pakistan—Karachi and Chittagong, being peripheral were not liked by industrialists and the ports of Bombay, Calcutta and Madras, being more centrally situated were chosen to locate industrial plants.

(c) *Dearth of coal and iron.* Pakistan had no good coal fields, and lay far away from them. Iron ore was also found far away. Industry developed in Bihar and adjecent parts due to this cause and industrial towns like Jamshedpur, Asansol and Dalmianagar grew up here and not in Pakistan.

(d) *Lack of capital and enterprise.* Communities like Marwaris and Parsis who possessed business acumen lived in India and started industries in India. Among muslims there were many traders but few industrialists. Therefore the muslim majority areas developed few industries.

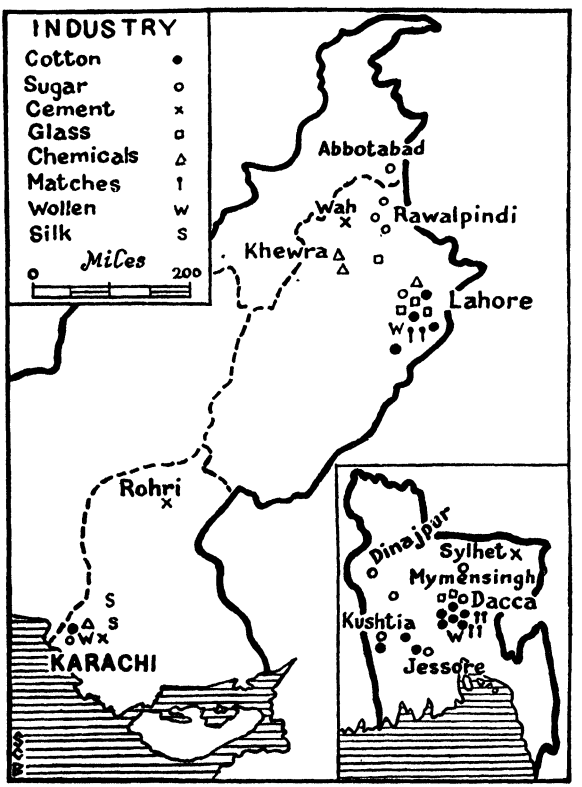
(e) *Location of engineering and technical institutes* in undivided India was mainly in central parts. The two engineering colleges are at Roorkie and Calcutta. Many important central institutes like the Survey of India at Calcutta, the All-India Meteorological Station at Poona, the Mining College at Dhanbad, the Agricultural Institute at Pusa and Forest Research Institute at Dehradun are all in India. Pakistan has, therefore, suffered from a lack of technically skilled personnel. She is gradually establishing new institutes, but it will take some time, before trained persons begin to come out from them.

Many of the drawbacks of Pakistan will disappear in time but lack of coal will hamper development. The problem of the supply of power will remain unless new and extensive oilfields are discovered. The Government of Pakistan is taking energetic steps to raise the industrial output of the country. In April 1948, the Government announced her industrial policy the salient features of which were: (a) inviting foreign capital for industrial and economic objectives: (b) nationalization of industries of public utility and (c) setting up of machinery for planning and execution of future industries. The Pakistan Council of Industries

was inaugurated in September 1949. The government assumed direct responsibility for the development of 27 major industries under the Federal Control of Industries Act, 1949. A campaign of "Patronize Pakistan's Products" was also started.

Cotton Textile Industry

At the time of partition 14 cotton textile mills existed in Pakistan—9 in East Bengal, 4 in Punjab and one in Sind. The



Map 70
Industrial Distribution.

total production capacity of these units comes to 104 million yards of cloth per year as compared to the normal requirements of about 675 million yards. It was, therefore, decided to establish

textile mills with a total capacity of one million spindles in the first 5 years, and a further 1.5 m spindles in the next 5 years. Machinery is being procured from U. K., U. S. A. and Japan. Three new textile mills have started working at Karachi, Lyallpur and Rahim Yar Khan (Bahawalpur). Four other mills will go into production in W. Pakistan by the end of 1950. A new mill with 50,000 spindles is to be established in E. Bengal. As Pakistan produces 1.3 m bales of cotton, 90% of which is good quality American type, her mills will always have no difficulty in the supply of first quality raw material.

Pakistan also plans to establish three privately owned *jute mills* near Chittagong for producing hessians and gunny bags. Government has also decided to establish initially five jute mills, each having 1,000 looms. The first mill is expected to go into production by the middle of 1951. Pakistan is the largest producer of raw jute in the world, and all the fine quality jute grows in E. Bengal.

Partition made Pakistan entirely depndent on imports of *woollen and worsted goods,* as all the woollen mills fell to the share of India. Pakistan has at present only one worsted mill, with 2,000 spindles. A woollen mill with 4,000 spindles has recently started production in Karachi. It is planned to instal some 24,000 woollen and 20,000 worsted spindles by 1955. Woollen spinneries are also being designed to produce woollen yarn, blankets, carpets coarse tweeds, rugs and flannels in Baluchistan and N. W. F. P. The annual production of wool in Pakistan is 26.5 m lbs and import through land frontiers about 8.5 m lbs. Thus 35 m lbs of wool are available for the development of a large scale woollen industry.

There are two *silk mills* in Sind depending on the supply of raw silk from the mulberry plantations around Quetta.

Chemical industry is being gradually developed. Pakistan wants to establish five privately owned *Pharmaceuticals and Drugs* manufacturing concerns—three in W. Pakistan and two in E. Pakistan to produce tinctures and chemicals. Proposals for establishing one such unit have already been made. A *Bureau of Laboratories* established under the Government is preparing vaccines. A factory at Quetta is manufacturing *Ephedrine*

Hydrochloride. Another for manufacturing *Santhonin* is being shortly installed. Two factories at Rawalpindi and Sukkur are producing 330 tons of *sulphuric acid* per year. A new plant with a capacity of 7,300 tons of sulphuric acid per year is to start production by the end of 1950.. The chemical factory at Khewra, which closed down after partition, is now producing 20,000 tons of light *soda-ash* per year. Very soon it will begin the production of (heavy) soda-ash. Production of a small amount of caustic soda and *chlorine* will also be taken up. A plant producing 100,000 tons of *ammonium sulphate fertilizer* is to be set up in W. Pakistan.

Soda for washing is produced by 812 big and small factories. A new toilet soap manufacturing plant has been set up at Karachi. Two more such plants are to be erected, one at Karachi and another in Bahawalpur.

Two new plants have recently been set up for producing hydrogenated edible oil or *vegetable ghee,* each with a capacity of 3,000 tons. One is at Karachi and the other at Hyderabad.

Sugar Industry

Pakistan produces about 30,000 tons of mill-made sugar per year, against her consumption of 200,000 tons. She is therefore forced to import large quantities of sugar from India and elsewhere.

There are 6 sugar mills in E. Bengal in Dacca, Jessore, Rajshahi, Dinajpur and Mymensingh, whose output is about 20,000 tons. In 1949, however, there production fell to 15,000 tons, more cane being diverted for making gur, whose price was high.

In Punjab there are four factories in Rawalpindi. In N. W. F. P. the Takht-i-Bahi and Rahwali factories produced 12,000 tons of sugar in 1949.

To meet the needs of the country a large sugar mill has been erected at Mardan, with a capacity of 50,000 tons per year. Experimental crushing in it has already been carried out, and it will go into full production in the 1950-51 crushing season.

Power alcohol is produced in association with mill-sugar manufacture. It is intended to instal a power alcohol plant at

Mardan producing 10,000 gallons per day. Another distillery will be installed in N. W. F. P. producing 1,100 gallons per day. A power alcohol plant will also be set up in E. Bengal. At present there are three small distilleries in W. Pakistan at Rawalpindi, Kotri and Quetta. Another distillery is working in E. Bengal.

Cement

Production of cement in Pakistan was 575,000 tons in 1949. Of this 500,000 tons was produced in W. Pakistan. Here there are factories at Wah in the Salt Range and at Rohri and Karachi. At all these places good quality limestone, gypsum and clay is obtained in large quantities. W. Pakistan has a surplus production of cement, part of which is exported. In E. Bengal limestone is available in Sylhet where there is a factory producing 75,000 tons of cement every year. The production of this cement factory is being doubled. Efforts are being made to manufacture *fire-bricks* from fire-clay found in Dera Ismail Khan.

Pakistan is self-sufficient in the production of *matches*. She has six match factories located at Lahore and Dacca. One of the factories in Lahore belongs to the Western India Match Company, belonging to the powerful Swedish match combine.

Paper worth Rs. 3 crores is imported annually in Pakistan. With a view to meet part of this great demand an up-to-date factory is being established in Chittagong Hills capable of producing 350,000 tons of paper per year. Kuptaimuk has been suggested as a suitable site. Bamboo pulp, which will be used as raw material is obtained here abundantly. The factory will cost Rs. 5 crores.

Glass sand being available in Sind, Punjab and N. W. F. P. efforts are being made to set up a modern glass factory to produce flat glass, scientific and industrial glass and optical glass. Three glass factories in Punjab and two in E. Bengal produce bottles, jars, pots, glasses and chimneys.

Tanneries and footwear manufacturing concerns are few in Pakistan when compared to the production of raw hides and skins, which amount to 8 lakh buffalo hides, 45 lakh cow hides, 53 lakh goat skins and 20 lakh sheep skins. More leather works are being established by Government aid.

Besides the industries discussed above *electric lamps* are manufactured by one firm, *electric fans* by another and *hurricane lanterns* by another.

Finally it is keenly felt that *cottage industries* will continue to play an important role in the economy of Pakistan for a long time to come. 90% of the population of Pakistan are agriculturists who in their spare time have no work. Certain cottage industries afford an excellent avenue of employment for such people, and give them a much needed help in cash. Thousands of refugee artisans who migrated to Pakisean may be easily absorbed in cottage industries. As an example may cited the enamel workers of Moradabad and the filigree (zari) workers of Delhi.

Communications

The communications of India before partition were developed without any idea of division. So many communication lines were cut asunder and disrupted by partion. The nodality of Lahore and Calcutta as communication centres was destroyed as they became border towns overnight. It will take some time before the roads and railways again become cohesive units by the construction of new links.

Roads

Pakistan has 8,000 miles of metalled roads and 50,000 miles unmetalled roads. Of the former about 5,500 miles are first class superior surface roads. E. Bengal has fewer roads as compared to W. Pakistan, for waterways are more important in the Ganges delta. The following table gives the provincial distribution of the mileage of the two types of roads:—

Province	*Metalled*	*Unmetalled*	*Total*
Punjab	3,104	12,883	15,987
N. W. F. P.	1,223	1,899	3,122
Sind	757	11,648	12,405
Baluchistan	1,223	3,453	4,676
E. Bengal	1,622	20,172	21,794
Total	7,929	50,055	57,984

Number of motor vehicles on roads on 31st December 1949 was

Motor trucks, buses and vans	....	....	10,583
Motor cars and taxis	....	....	17,503
Motor cycles	....	....	3,242
	Total	....	31,328

The British Government built a large number of strategic roads along the western frontier, which gives a big mileage of metalled roads to the sparsely populated N. W. F. P. and Baluchistan. W. Pakistan on the whole has a large number of good roads. Good road metal is easily available. Lime concretions called kankar found in the soil constitute a good road metal. Punjab and Sind have level lands where roads can be easily built. Rivers are not navigable, and there is only a negligible traffic by water. Rivers can also be bridged being not too broad. Again there is very little rainfall and damage to roads therefore is less.

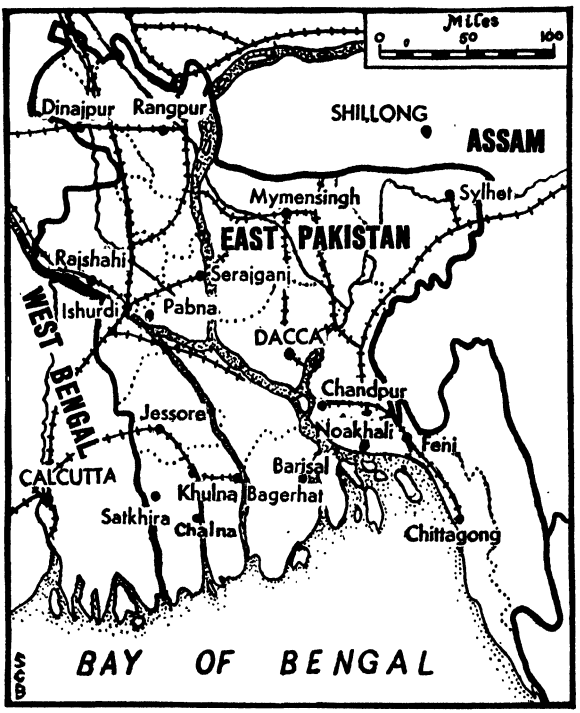
In E. Bengal conditions are different. Road metal is not available. There are broad navigable rivers, which are very difficult to bridge. Heavy rain raises the maintenance cost of roads. Unmetalled roads become quagmires in the rainy season. Boats are more important than bullock-carts.

In a Road Conference held in Karachi in May, 1949, it was decided to create a Road Fund by levying an extra duty of 2½ annas per gallon on petrol. Another step forward was the formation of a Pakistan Road Engineers' Association, which has been asked to formulate an All-Pakistan Road Development Plan. Meanwhile the Provincial Governments have formulated their own plans for developing roads and have started many small road improvement and bridge-building works.

Railways

There are two railway systems in Pakistan, (a) North Western Railway in W. Pakistan with 5,362 route miles, (b) East Bengal Railway in E. Pakistan with 1,631 route miles. The total route mileage is 6,993 miles. All the railways of Pakistan are nationalized.

East Bengal Railway serves 49,000 square miles and 46 million people with only 1,631 miles of lines. It is mainly due to the existence of mighty rivers, which are navigable but difficult to bridge. The Brahmaputra—Jamuna—Padma—Meghna river line divides the railway system in two parts, connected only by ferry steamers, which involve a double break of bulk. The Padma has only one bridge at Sara across it. In Barisal District there are no railways.



Map 71
Eastern Pakistan.

The main railway line in the western part of E. Bengal is the double-track broad gauge route from Darsana to Chilhati, crossing the Padma at Sara. Originally it connected Calcutta with Siliguri. The following branch lines bifurcate from it:—

(a) Poradah to Goalundo, from where a steamer service connects with Narayanganj and Chandpur. From this branch two more branches are given out; (i) Pachooria to Faridpur and (ii) Kalukhali to Bhateapara.

(b) Ishurdi to Serajganj Ghat from where a steamer service connects with Jagannathganj.

(c) Abdulpur to Amnura. A metre gauge line runs through Amnura from Godagari Ghat to Nachoul beyond which it enters India.

(d) Metre gauge line from Santahar to Kaunia via Bonarpara, which connects with Fulchhari Ghat, from where a steamer service connects with Bahadurabad.

(e) Metre gauge line from Parbatipur to Mogalhat via Kaunia. From it a branch goes from Tista to Kurigram and another from Lalmonirhat to Patgram.

(f) Parbatipur to Raiganj. From it a branch goes from Kanchan to Ruhea. The branches (e) and (f) served as the rail route to Assam before the construction of the Assam Rail Link through Indian territory.

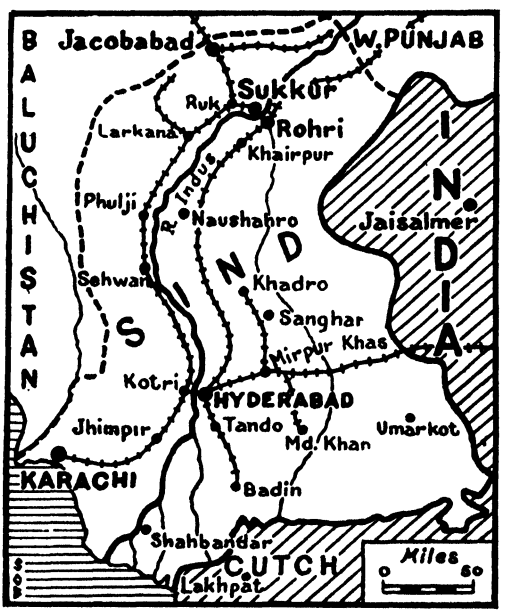
A broad gauge line runs from Benapol to Khulna via Jessore. At Khulna steamer routes start for Barisal, Madaripur, Satkhira and Rupsa. A narrow gauge line runs between Rupsa and Bagerhat. A 44 miles railway link is under construction between Jessore and Darsana and will be opened to traffic in April, 1951. This will connect with the main line the Jessore—Khulna section, separated from the rest of the E. B. Railway system by partition.

The railway system in the eastern part of E. Bengal consists of two parts connected at the Meghna bridge near Bhairab Bazar. It consists entirely of metre gauge lines. A line starts from Narayanganj, which is connected by steamer service from Goalundo, to Dacca and beyond to Mymensingh. A line from Mymensingh goes to Singhjani, where it bifurcates to Jagannathganj and Bahadurabad, where there are steamer connections with the opposite bank. Another line goes from Mymensingh to Akhaura across the Meghna. A branch connects Bhairab Bazar with Tangi on the Dacca—Mymensingh line.

Another main railway line runs from Chandpur, which has a steamer connection with Goalundo, to Chittagong via Laksam. From here a line runs south to Noakhali and another to the north

to Comilla, Akhaura, Kulaura and Barlekha near the border. From Kulaura a branch goes to Sylhet.

North Western Railway. This railway system consists of a network in Punjab sending out long arms of lines to Sind and Baluchistan. The flat terrain in the Indus valley and the comparative ease with which bridges can be built over rivers has resulted in a greater development of railways here. Many far flung railway lines in N. W. F. P. and Baluchistan were built by the British for strategic reasons.



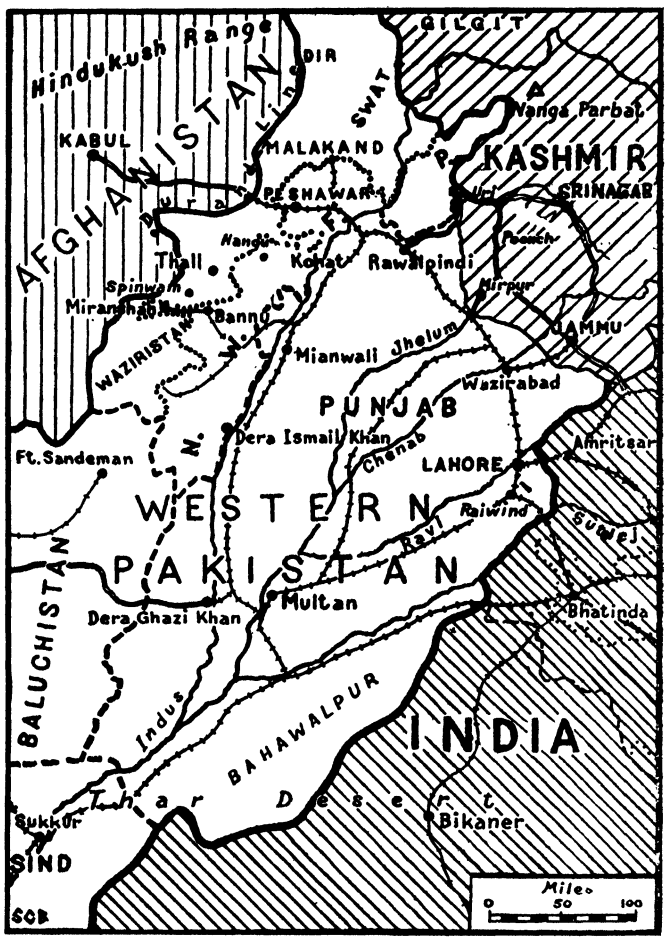
Map 72
Sind.

The main railway line connects Lahore with Karachi. It passes through the following stations:—

Lahore—Raewind—Montgomery—Khanewal—Lodhran—Samasata—Rohri—Kotri—Karachi.

Between Rohri and Kotri there are two routes on the two banks of Indus, which is bridged at Sukkur and Hyderabad. From Hyderabad a metre gauge line runs east to Khokhropar and

then proceeds beyond the frontier to Jodhpur. Another branch goes south from Hyderabad to Badin.



Map 73
Punjab and North West Frontier Province.

The other main line runs from Lahore to Landi Khana on the frontier in the Khyber Pass. It passes through the following stations:—

Lahore—Wazirabad—Jhelum—Rawalpindi—Taxila—Attock —Nowshera—Peshawar—Landi Khana.

A third line connects Attock with Samasata passing through the following station:—

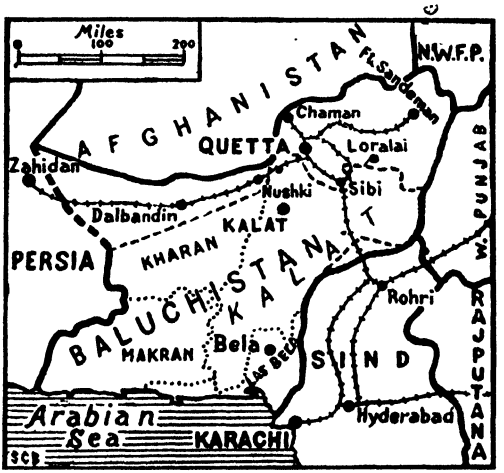
Attock—Jand—Mianwali—Mahmud Kot—Sher Shah—Lodhran Samasata.

In the triangle formed by Lahore, Attock and Samasata there is a net work of lines serving the irrigated colonies of Punjab. A line also connects Kasur and Lodhran. The two pre-partition main lines which connected Lahore with Delhi via Amritsar and Ferozepore terminate at Wagah and Gandasingh Wala.

In N. W. F. P. there are the following broad gauge branch lines:—

(a) Nowshera to Dargai, (b) Taxila to Havelian, (c) Jand to Kohat.

There are also the following branch lines:—



Map 74
Baluchistan.

(a) Kohat to Thal, (b) Kalabagh to Laki and Bannu, (c) Laki to Manzai.

The railway line to Baluchistan starts from Ruk near Sukkur and proceeds to Chaman on the frontier through the following stations:—

Ruk— Jacobabad— Bolan Pass— Sibi—Spezand— Quetta—Bostan—Gulistan—Chaman.

An alternative line joins Sibi with Bostan via Harnai. A narrow gauge strategic line runs from Bostan to Fort Sandeman via Hindubagh.

Another broad gauge line runs to Zahidan on the Iran border from Spezand via Nushki, Dalbandin, Nok Kundi and Mirjawa.

A new line, 70 miles long, is also under construction in the Indus delta from Tando-Mohd Khan to Moghalbhim.

The Quetta section of the N. W. Railway passes through some of the wildest hilly regions. Near Chaman is the three mile long Khojak tunnel, being the longest in Pakistan and India.

Inspite of many difficulties resulting from partition, specially the shortage of coal supply, the railway service has been gradually improving. Old coaches have been repaired and 144 new steel coaches have been purchased. On the N. W. R. there were 74 daily passenger trains in March, 1948, which increased to 191 per day in March, 1949. Special fast services were introduced in East Bengal between Dacca and Chittagong and Dacca and Dinajpur. There was a 50% increase in the number of passengers carried on both the railways from 1948 to 1949. The average daily wagon loading also increased by the same amount.

The Pakistan Railways showed a net gain of Rs. 78,747,000 in 1948-49 and Rs. 53,166,000 in 1949-50.

Waterways

River navigation in W. Pakistan is unimportant. The Sukkur barrage across the Indus does not allow any river traffic to proceed above it. The navigability of the Punjab rivers is also gradually decreasing due to silting. No effort has yet been made to improve their navigation. Country boats ply in them during the rains.

In East Bengal river navigation is more important than roads and railways. Besides traffic by country boats, steamers ply on all the major rivers. There are regular passenger services connecting railway terminii on river banks. The most important steamer services are:—

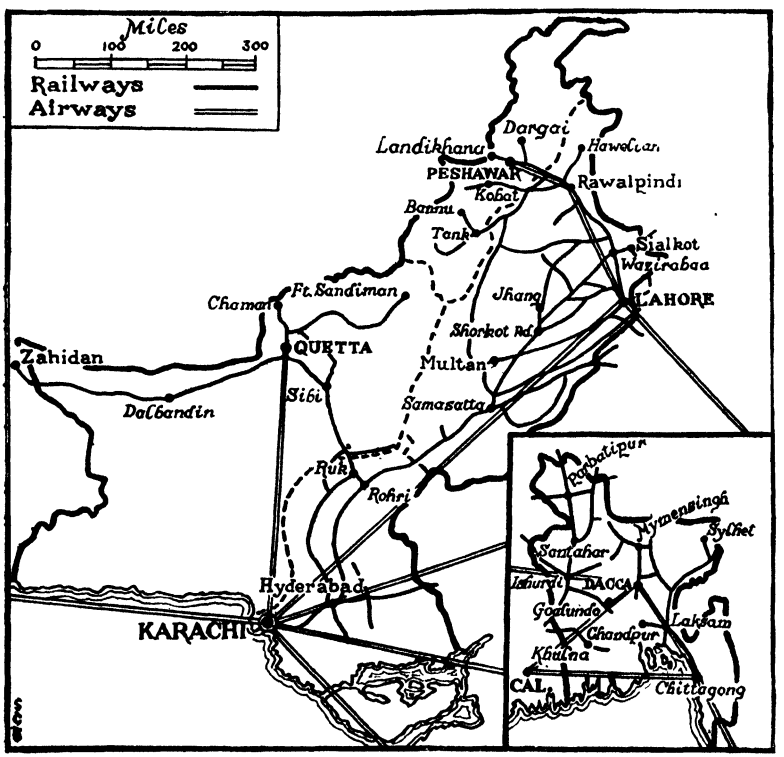
(a) Goalundo to Narayanganj
(b) Goalundo to Chandpur
(c) Khulna to Barisal

Goods traffic passes from Sundarbans to the borders of Assam along the old Calcutta—Assam river route. The East

Bengal Railway have purchased the nucleus of a River Flotilla for transport of goods between the port of Chittagong and its hinterland. It has been raised to a capacity of 350,000 tons per annum in April, 1950.

Airways

Civil aviation has increased rapidly in Pakistan. Karachi is an up-to-date International airport through which all the main



Map 75
Airways and Railways.

world air-lines pass. They include the Pan American Airways, the British Overseas Airways Corporation and various other European and Asian air-lines. The only direct connection between the two Pakistans is by air.

The chief air company is the Orient Airways Ltd., which runs the following services:—

(1) Karachi—Delhi—Dacca—Calcutta—Delhi—Karachi.
(2) Karachi—Lahore—Rawalpindi—Peshawar.
(3) Karachi—Quetta.
(4) Karachi—Bombay.
(5) Calcutta—Chittagong—Akyab—Rangoon.
(6) Dacca—Calcutta.
(7) Dacca—Chittagong.

In June, 1949 the mileage flown by the aircraft of the company was 113,100.

Pak Air Limited received an operating licence in June, 1948. It operated three services given below:—

(1) Lahore—Delhi
(2) Karachi—Delhi
(3) Karachi—Lahore—Rawalpindi—Peshawar.

Its aircraft had flown 64,000 miles in June, 1949. The company's operations were suspended after the crash of one of her Dakota planes near Jungshahi on 12th December, 1949.

A large number of special *Haj* flights are made every year to carry pilgrims to Jeddah. 185 Hajis travelled by air in 1948. The number was much larger in 1949 and 1950.

There are three flying clubs in Pakistan in Karachi, Lahore and Dacca which are subsidized by the Government. Pilots are trained by them.

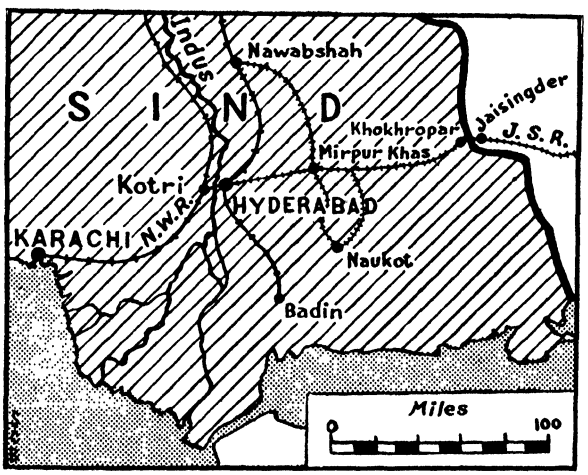
There is also an air charter company in Pakistan named Crescent Air Transport Ltd. which has been granted permission for the operation of charter services.

In all there were 59 civil aircraft in Pakistan on 31st March, 1950, out of which 30 were multi-engined. The finest aircraft are the three convairs possessed by the Orient Airways Ltd. There are two Skymasters, belonging to Pak Air. Other big aircrafts are Dakotas.

Ports and Towns

Karachi. Beside being the capital city of Pakistan and a modern airport on an international air route, Karachi has a fine natural harbour. The whole of W. Pakistan as well as Afghanistan and the south-eastern part of Iran now constitute its

hinterland. Before partition a part of Rajasthan and E. Punjab fell within its hinterland, but are now served by Indian ports. After the attainment of freedom and the selection of Karachi as the capital, the port, the town and its hinterland are developing gradually. A number of industries including textiles, chemical and cement have grown up in its suburbs. The immediate hinterland in Sind has become a rich agricultural land by the help of irrigation, and being thinly populated, consumes less, and so is a



Map 76
Karachi and its Environments.

surplus area. The hinterland is well served by railways. The trade of the populated plains of Punjab passes through Karachi. The following figures (in tons) show how the traffic* in Karachi has gone up :—

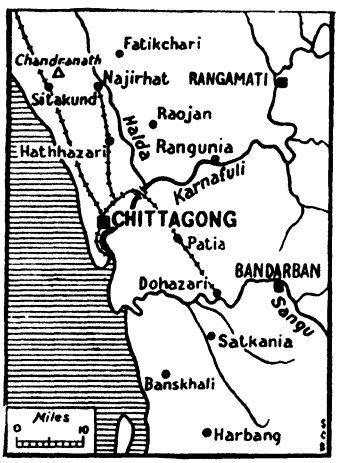
Year	*Imports*	*Exports*	*Total*
1947-48	1,156,353	1,027,521	2,183,874
1948-49	1,602,747	939,934	2,542,681
1949-50	1,908,422	923,476	2,831,896

Plans have been made for the improvement of the port. A scheme is under consideration to undertake an improved lay-out

* Three years of Pakistan. Govt. of Pakistan Publication.

of the 17 berths in the East Wharves, which will increase the capacity of the port by 34% to 50%. A naval dry dock and a commercial dry dock will be constructed as early as possible. A new fish-landing port is also to be constructed.

Chittagong. With partition the importance of this port has greatly increased. During the period of strained relations with India and stoppage of coal from her, Chittagong was required to handle more traffic than her capacity. A system of priority berthing was introduced for visiting foreign ships. Export cargoes were pooled and allotted to various ships. The berthing capacity was increased from 4 to 13 berths, raising the annual handling



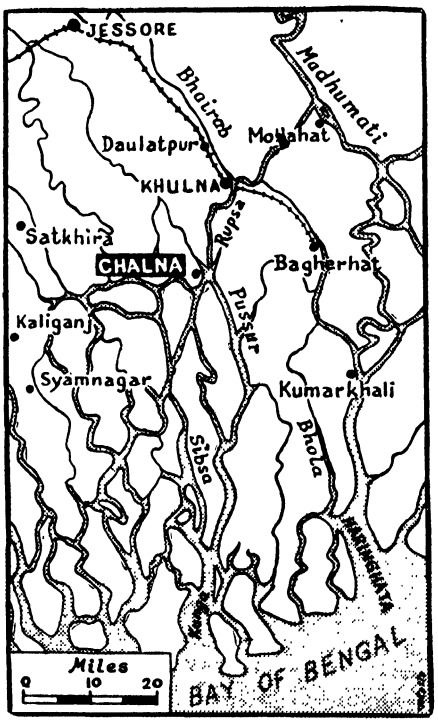
Map 77
Chittagong and its environments.

capacity from .5 m tons to 1.8 m tons. Lighting arrangements to enable night pilotage in the Karnaphuli are well underway.

A plan costing Rs. 14.48 crores has been drawn up to improve the port by the end of 1953, and raise its handling capacity to 4 m tons. The plan includes the construction of 5 new general cargo berths, 2 salt berths, 1 coal berth, 2 salt golas, 10 transit sheds and 11 bounded warehouses. Further there are provisions for cranes, electricity and water supply, railway yards, roads and office buildings.

After improvement the port will be able to handle jute and tea export traffic and import of coal, food grains etc. The development of industry in E. Bengal will raise the importance of the port further.

Meanwhile, a survey of river mouths in E. Bengal has revealed the possibility of having a sheltered anchorage for deep sea vessels near *Chalna* on the Pussur river, which is a southward continuation of Rupsa, on which stands the town of Khulna.



Map 78

The location of Chalna, the new deep-sea river port of E. Pakistan.

Chalna is at present an important river port in Khulna District and is served by river steamers. It is hoped that this anchorage will be in operation by the end of 1950.

Among the inland towns of W. Pakistan *Lahore* is the most important. It is the capital of Punjab. It is an important railway junction and many roads converge on it. But it has lost

its nodality after partition. It is a very old town and is known for many handicrafts. It stands on river Ravi. It is also an airport. It is an important grain market. Textile, glass, leather chemical and match factories are situated here. It is also the leading printing and publishing centre of W. Pakistan, being a University town. After partition it was much damaged by rioting. Hindu businessmen left it. It is gradually recovering to its former vigour.

Lyallpur is situated in the centre of the colony irrigated by the Lower Chenab Canal. It is therefore important for wheat trade. It has an agricultural college.

Rawalpindi is an important road and rail junction. It has also an airport and a contonment. It is a leading grain market.

Murree is a fine hill station and cantonment at a height of 8,000 feet in the Himalayas. A road from here goes to Srinagar in Kashmir, but it is closed to civilian traffic at present.

Multan is a big trading centre of South Punjab, where routes from Gomal pass and Dera Ghazi Khan converge. Afghan traders come here with fresh and dry fruits, nuts, wool, skins and asafoetida. They barter them for manufactured goods, textiles and sugar which they take back to Pakistan.

Peshawar is the capital of N. W. F. P. and guards the Khyber Pass route to Afghanistan. It is a big cantonment, through which run the road and the railway to the frontier. It is also the trade centre of the Kabul valley. A new university has been established here.

Bannu and *Kohat* are strategic towns with contonments, and guard the Tochi and the Kurram passes.

Mardan is a rising sugar manufacturing town.

Quetta is the capital of Baluchistan. Lying 7,000 feet above sea level it enjoys a cool summer. It is the centre of the great fruit producing region of Baluchistan and has a fruit research station. Lying astride the route from Afghanistan, through the Khojak Pass, it has a strategic importance, and so is an important cantonment.

Chaman is a famous grape producing centre. *Hindubagh* is important for its chromite mines.

Ziarat is a fine hill station 6,000 feet above sea level.

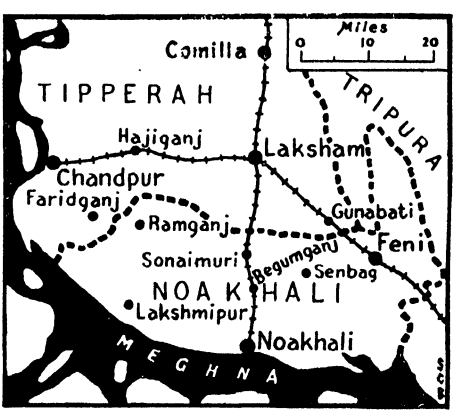
Hyderabad is the second town of Sind. It is a road and rail junction.

Rohri has a cement factory.

Sukkur is at the headworks of the Sukkur Barrage.

Dacca is the capital of E. Pakistan. It grew up during the period when Bengal was ruled by Muslims. Many fine arts grew up under the patronage of Nawabs, the most famous being the weaving of fine muslin cloth. Today the quality of muslin produced has deteriorated. Other hand loom products like saris are also made in Dacca. Bangles from conch shells, buttons from shells, gold, silver and brass work of Dacca are also important. Around Dacca a number of modern industries have developed, such as cotton textiles (at Narayanganj), glass, woollen goods and matches. Dacca is a University town. It has also an airport. A plan has been drawn up to develop the city on modern lines to provide accomodation for administrative offices and Government staff who have shifted here from Calcutta.

Chandpur, Goalundo and *Serajganj* are important river ports



Map 79
Hinterland of Chand-pur and Noakhali.

with steamer services. All of them carry considerable trade in jute.

Barisal is a district headquarters and a leading trading centre of rice, betelnuts and coconuts. It is served entirely by steamers

Khulna is the terminus of the railway and the starting point of the steamer routes of E. Bengal. It is therefore a great trading centre of betelnuts, coconuts and paddy. It is also important for handloom products. There are two textile mills in Khulna.

Jessore is important for its comb manufacture and production of good quality indigenous sugar.

Rangpur is an important trading centre for tobacco.

Sylhet is important for the collection and export of tea, oranges and pineapples.

Foreign Trade

Partition left Pakistan surplus in many commodities and deficit in others for the economy of the country was not developed in the past century on the assumption of separation. The surplus commodities are mainly raw materials and the deficit products are manufactured goods. Attempts to make her self-sufficient in those things in which she found herself deficit have started, but will take time. Hence the big volume of foreign trade which has been necessary in the beginning will gradually fall. This is specially so in the case of trade with India.

Pakistan features today as an important exporter of industrial fibres such as jute, cotton and carpet wool which normally account for 90% of her exports. Her imports consist mainly of manufactured and semi-manufactured goods. Textiles, machinery and vehicles are leading commodities of import.

Pakistan has a *favourable balance of trade.* In 1948-49 her total exports were Rs. 173.33 crores and imports Rs. 141.43 crores, leaving a favourable trade balance of Rs. 31.9 crores. After the devaluation of the Indian rupee the foreign trade of Pakistan received a set back, but gradually rallied back. During the period from October, 1949 to March, 1950 Pakistan had a favourable balance of sea-borne trade of Rs. 5.2 crores.

Imports

Manufactured articles constitute 77% of Pakistan's import trade. The comparative values of the principal articles of imports for two years in lakhs of rupees are given below:—

	1948-49	*1949-50*
Cotton piece goods	2,693	2,570
Cotton yarn and twist	1,125	1,636
Machinery	567	825
Vehicles	472	522
Metal and ores	342	453
Mineral oil	280	397
Drugs and medicines	422	243
Provisions	207	343
Tobacco manufactures	273	300
Instruments and apparatus	206	199
Hardware	75	132

Some other imported goods in 1949-50 were rubber manufactures—Rs. 170 lakhs; paper and past-board—Rs. 157 lakhs; tanning and dyeing materials—Rs. 194 lakhs; chemicals—Rs. 144 lakhs.

Cotton textiles are supplied by India, U. K. and Japan. But the share of India fell considerably in 1949-50 as the following figures in lakhs of rupees show:—

	1948-49	*1949-50*
India	1,596	354
United Kingdom	474	954
Japan	61	660
Others	562	502

Supply of yarn in lakhs of rupees came from the following countries:—

	1948-49	*1949-50*
Italy	173	494
United Kingdom	271	362
Egypt	4	273
India	173	86

Machinery was imported mainly from U. K. and U. S. A. as the following figures in lakhs of rupees show:—

	1948-49	*1949-50*
United Kingdom	387	442
U. S. A.	136	244

Other suppliers of machinery in 1949-50 were Japan—Rs. 53 lakhs, Czechoslovakia—Rs. 17 lakhs, Germany—Rs. 8 lakhs.

Exports

The chief exports of Pakistan in 1949-50 in lakhs of rupees were:—

Jute	5,185	Hides and skins	240
Cotton	3,550	Fish	52
Tea	491	Manures	45
Wool	316	Cotton seeds	40

The chief buyer of *jute* is India, which bought Rs. 22,08 lakhs worth of jute in 1949-50. India's purchase had, however, fallen due to trade-deadlock. Export of jute to other countries increased. U. K., France and Italy raised their jute imports from Pakistan as the following figures in thousand bales show, for the period October to April for two years.

	1948-49	*1949-50*
United Kingdom	263	305
France	108	169
Italy	49	86

Cotton is the second leading item of export of Pakistan. The share of purchase of India fell sharply while those of Japan, Hongkong and France rose as the following figures in thousand bales show for the years 1948-49 and 1949-50.

	1948-49	*1949-50*
India	37,000	11,500
Japan	19	95
Hongkong	59	128
France	9	63

Total *raw wool* exported in 1949-50 was 23.71 m lbs as compared to 22 m lbs in 1948-49. Chief buyers of raw wool were U. K. and U. S. A. Their purchases in million lbs for two years are given below:—

	1948-49	*1949-50*
United Kingdom	8.44	12.56
U. S. A.	12.69	9.14

Italy bought .51 m lbs and Canada .57 m lbs of raw wool in 1949-50.

About 70% of the total output of *tea* in E. Bengal, which is estimatad at 45 m lbs is exported. The export of tea in the last three years was:—

1947-48	52.9	m lbs
1948-49	26.5	„
1949-50	33.3	„

U. K. buys 90% of the tea of Pakistan. Her purchases were as follows:—

Year	*quantity*	*value*
1948-49	24.8 m lbs	Rs. 355 lakhs
1949-50	30.6 m lbs	Rs. 454 lakhs

The chief buyers of Pakistan's *hides and skins* in lakhs of rupees in 1949-50 were

U. S. A.	74	Netherlands	17
Italy	45	Sweden	13
Germany	40	France	7
U. K.	36	India	7

Spain and India which bought hides and skins worth 189 and 31 lakhs of rupees in 1948-49, reduced their purchases to 1 and 7 lakhs in 1949-50.

Direction of Trade

Pakistan's trade is mainly with India, U. K. and U. S. A. Due to trade dead-lock with India the trade with her has fallen.

The following table gives the direction of imports to Pakistan in millions of rupees for two years:—

	1948-49	*1949-50*
United Kingdom	270	348
India	449	176
U. S. A.	80	120
Japan	10	94
Italy	38	82

Direction of exports in millions of rupees is given below:—

	1948-49	*1949-50*
United Kingdom	148	172
India	216	77
U. S. A.	88	61
Hongkong	24	58
Japan	12	58

Trade with U. K. has steadily increased. Machinery and textiles are purchased from her and jute, tea, wool and hides and skins sold in return.

With U. S. A. the trade has shown a decrease and there has been an increasing adverse trade balance. U. S. A. buys raw materials from Pakistan and supplies machinery.

Trade with Japan has increased rapidly during 1949-50. She purchased cotton and jute from Pakistan and exported cotton textiles and machinery to her.

Trade of Pakistan with India has fallen sharply due to strained relations, trade disagreements and lastly the devaluation of the Indian rupee. In natural course Pakistan should have the largest amount of trade with her neighbour, for this will be for the good of both the countries.

A trade agreement was signed between the two countries in 1948-49 and then again in 1949-50, but the terms of none of them were carried out fully. Accordingly the actuals fell short of

targets in 1948-49. The 1949-50 agreement envisaged a reduced quantum of goods. But the trade deadlock was complete in October 1949. In April 1950 a temporary barter agreement was signed, providing for the export of 4 m maunds of jute to India in exchange of cotton and woollen textiles, mustard oil, tobacco and timber. This agreement was fully honoured. But after its expiry in September 1950, it was not renewed. (See Chapter XIV)

In 1949-50 Pakistan's exports to India were headed by raw cotton, followed by grain, oil seeds, fodder, fruits, vegetables, fish, hides and skins. Jute occupied a very minor position very strangely.

The imports from India in the same year were in order of importance cotton textiles, tobacco, jute manufactures, coal, chemicals, leather, fruits, vegetables, iron and steel goods, cutlery, vegetable oil, rubber manufactures and paper.

——o——

APPENDIX

Questions set in various examinations by universities and other institutions are given below. They are classified according to the chapters of the book.

CHAPTER I

1. Divide India into natural regions. Describe and account for the climate, the products and industries of each region. (C. U. I. Com. '29, '33).

2. Compare the north-east and north-west of India proper in respect of (a) physical features, (b) means of communication, (c) climate, (d) agricultural production and (e) conditions affecting production. (C. U. I. Com. '41).

3. Give an account of the land frontier routes and passes on the northern borders of India.

4. Give an account of the part played by the river Ganges in the economic life of India. (C. U. I. Com. '47).

5. Divide India into natural regions. Describe the climate, products and industries in each of them. (C. U. I. Com. '48; W.B.C.S. '49).

6. Discuss the possibilities of linking up the Indian railways with railways in other countries of Eurasia. Examine the probable effects of such linking up on the overland foreign trade of India. (I. I. B. 1931).

7. Name the three natural divisions of India and explain how they influence the economic geography of each region.

CHAPTER II

1. "Probably there is no other single group of weather phenomena which is so far-reaching, in its effects as the Indian monsoon." Explain. (C. U. B. Com. '25.).

2. What do you understand by Monsoon type of climate? Can you say why so much importance is attached to monsoon in India? (C. U. I. Com. '42).

3. "The monsoon is our great friend and formidable foe." How far do you agree with this statement? Give reasons. (Pat. U. I. Com. '46).

4. Describe the effects of the monsoons on the economic life of India. (C. U. B. Com. '47).

5. Discuss the effect of climate on the distribution of agriculture and large scale industries in India. (C. U. I. Com. '49).

6. Give an account of the distribution of rainfall in India. Indicate the relation between rainfall and crop production. (Pat. U. I. Com. '47).

7. Write a short note on the climate of the Deccan Peninsula and show clearly the effect on agricultural production of the region. (C.U.B. Com. '29).

8. Contrast the windward side with the leeward side of the Western Ghats, and describe the important products of each side. (C. U. I. Com. '27, '30).

9. Describe the climate of any three of the following giving reasons for the differences observed: (a) Akyab (b) Calcutta (c) Darjeeling (d) Lahore, and (e) Simla. (C. U. I. Com. '30).

CHAPTER III

1. How does rain control the distribution of forests in India? Mention the main economic uses of forests. (Pat. U. I. Com. '46).

2. On a sketch map of India, show the regions with important timber resources. How are these utilized at present? Discuss the prospects of increasing exports of Indian timber to the world's markets. (C. U. B. Com. '40, Delhi B.A. Hons. '50).

3. What are the chief forest areas of India? Mention the important Indian forest products and the chief industries dependent on them. (C. U. B. Com. '25, '31, U. P. Board '43).

4. Discuss the position of India as a supplier of timber in the world markets. How in your opinion, can the export of this commodity be improved to the European markets, and which of the Indian timbers offers the best possibility? (C. U. B. Com. '38).

5. What are India's most important forests? Give instances, of the uses to which Indian forest products are at present put and discuss their future possibilities. (C. U. I. Com. '27, '31).

6. Is India rich in forest products? Mention the regions where these are available and their principal uses. (C. U. I. Com. '46).

7. What are 'Reserved' and 'Protected forests'? Name the principal kinds and products of forests found in India. Give a suitable map also. (U. P. Board '46).

CHAPTER IV

1. Give a short account of the soils of India. Classify them and give their characteristics.

2. What do you understand by the term "afforestation',? State the regions of India that are best suited for this purpose (C. U. I. Com. '49).

3. What is the relation between soils and agriculture in India? Give your answer with special reference to regurs, red loams and alluvial soils.

4. What do you know about soil erosion? How can afforestation check it?

CHAPTER V

1. Explain why irrigation is necessary in India. Distinguish between and account for the various types of irrigation characteristics of the different areas in the country. (Pat. U. I. Com. '46).

2. The Punjab is said to possess the most well-developed canal system in the world. Why? Give a description of the system and mention its economic advantage. (U. P. Board '42, '46).

3. Discuss the importance of irrigation in Southern India, and describe the different systems of irrigation prevailing there. (U. P. Board. '44).

4. Write a note on the Irrigation in the U P. (U. P. Board. '45).

5. Describe the various methods of irrigation in India, and discuss their relative importance. (U. P. Boards. '47, C. U. Inter. '45, Delhi B. A. Hons. '49).

CHAPTER VI

1. What do you know of the Damodar Valley Project? State the economic advantage Bengal and Bihar are likely to derive from it when the project materialises. (C. U. B. Com. '47, I. Com. '50).

2. Discuss the irrigation system of India. Also state what you know about the Damodar Valley Project. (C. U. I. Com. '47).

3. Discuss the development of water-power in India. (C. U. I. Com. '35, '37. U. P. Board. '46).

4. Give an account of the development of hydro-electric power in Southern India, mentioning new schemes. Estimate its influence on the economic life of the areas. (U. P. Board. '42).

5. What do you understand by the term "multipurpose project"? Also discuss fully the benefits likely to be derived when Damodar Valley project will be completed. (C. U. B. Com. '49, Delhi B. A. Hons. '50).

6. What are the chief sources of Industrial power in India? How far have they been utilised? (U. P. Board '44).

CHAPTER VII

1. Discuss the resources of India for development of Hydro-electric projects. Do you think it would be wise to develop such projects in the regions possessing coal. (C. U. B. Com. '48).

2. On a sketch map of India, locate the places where hydro-electric power is being utilized for irrigation purposes. What manufacturing industries, in your opinion, can be developed in those places? (C. U. B. Com. '38).

3. Analyse the geographical conditions suitable for the development of Hydro-electric power. How far are these conditions in existence in India? (C. U. I. Com. '45, B. Com. '48).

4. Give an account of the water power resources of India. How their development is expected to stimulate the industrial activities of the Indian people. (Pat. U. I. Com. '46).

5. What do you know of the hydro-electric development of Northern India? What are the sources from which power is obtained there and to what use is this supply of power mainly put? (C. U. B. Com. '30).

6. How is it that in India most of the Hydro-electric installations are located in the Deccan? Discuss the factors which should be present for the development of Hydro-electric power. (C. U. I. Com. '49).

CHAPTER VIII

1. On a sketch map the Indian Republic, show the important regions of production of food grains. How is it that the shortage of food stuff is being felt in many parts of the country? (Delhi B. A. Hons. '50, C. U. B. Com. '43).

2. For making India self sufficient in the matter of food, what planning would you advocate? (C. U. B. Com. '49).

3. Discuss the factors that have contributed mainly to the preponderance of agriculture in Indian Rural Economy. (Pat. U. I. Com. '47).

4. Why is the yield of wheat and cotton per acre so low in India? (U. P. Board. '46).

5. What are the main causes of frequent famines in India? On a map of India, show the areas most liable to or immune from famines. (U. P. Board. '47).

6. Discuss the main drawbacks of agriculture in India and its causes.

7. How far can mechanisation help agriculture in India? What steps have been taken in this direction?

CHAPTER IX

1. Briefly narrate the conditions favourable for the growth of rice and wheat. What parts of India are best suited for the production of these crops? (C. U. I. Com. '44).

2. Explain why (a) rice flourishes in the lower Ganges valley (b) tea on the lower-slopes of the Himalayas and (c) cotton in the Deccan. (Pat. U. I. Com. '46).

3. Name five important oil-seeds of India, describing the areas where they are grown and the uses to which they are put. (C. U. I. Com. '33, '46).

4. Examine the importance of any four of the following crops in India:—(a) Cotton, (b) Ground-nut, (c) Jute, (d) Linseed, (e) Rice, and (f) Wheat. (C. U. I. Com. '34).

5. Discuss the conditions favouring the growth of (a) Jute, (b) Oilseeds, (c) Coffee, and (d) Sugar-cane. Indicate the places where they are grown in India. (C. U. I. Com. '36).

6. Discuss the conditions favourable for the production of jute. Name the principal buyers of Indian Jute and Jute-manufactures. (C. U. I. Com. '47).

7. Name the two important fibres produced in India. Give an account of the conditions favourable for their large-scale production and their manufacture into finished products. (C. U. I. Com. '45).

8. On a map of India, show the areas producing cotton, jute and silk, and indicate the chief manufacturing centres. (U. P. Board. '43).

9. Give an account of the production in India of any four of the following, and discuss their importance in the trade and industry of the country:—(a) cotton, (b) sugar-cane, (c) oilseeds, (d) lac, (e) tea and (f) wool. (U. P. Board. '45).

10. Draw a map of India showing the areas producing sugar-cane, tea and coffee. (C. U. I. Com. '48).

11. Account for India's growing most of her sugarcanes outside the tropics. (U. P. Board. '41).

12. What are the principal plantation products in India? Discuss their present position and future possibilities.

CHAPTER X

1. Draw a map of India and show the important sources of supply of coal, iron ore and mineral oil. Also briefly describe the industries which have developed around these centres. (C. U. B. Com. '47).

2. On an outline map of India indicate the Gondwana coal fields. Which of these is the most productive? What are the reasons for an acute shortage of coal in India in recent years? (C. U. B. Com. '45).

3. On a sketch map of India, show the regions where iron, manganese and mica are found. Which of these minerals are mined for home consumption? Name the countries of the world that compete with India in manganese for export markets. (C. U. B. Com. '37).

4. Draw a map of India showing the regions where the most important minerals are obtained. (C. U. I. Com. '47, '50).

5. Draw a map of India and show on it the distribution of coal, iron, manganese, mica and copper and the centres of Iron and Steel industry. (U. P. Board '42, C. U. I. Com. '49).

6. Name the five most important mineral products of Bihar and give their distribution in different parts of the province. (Pat. U. I. Com. '46).

7. "India is the leading mica exporting country of the world and is likely to remain so." Examine the statement. (C. U. I. Com. '45).

8. Estimate the iron resources of India. Show how far these are located near the coal-bearing regions in India.. (C. U. I. Com. '36).

9. Carefully estimate the oil resources of India. (C. U. I. Com. '32).

10. What is the place of India (with Burma) as producer of non-ferrous metals? State briefly where these minerals occur in India and how they are mined? (C. U. B. Com. '30).

CHAPTER XI

1. What are the essential conditions for the development of fishing industry? Do you think that Bengal and Assam possess such facilities? (C. U. I. Com. '46).

2. State the conditions necessary for the development of the fishing industry and the provinces in our country which possess such facilities. (C. U. I. Com. '48).

3. How do you account for the backwardness of fishing industry in India? (U. P. Board '41).

4. Why the fisheries of India are little developed? (Pat. U. I. Com. '46).

5. Examine the present position and the future prospects of the fishing industry in West Bengal. (W. B. C. S., '49).

6. Write short informative accounts of two of the following:—

(a) Irrigation in India, (b) Sources of fish supply in India, (c) Importance of sericulture in India's commerce. (C. U. I. Com. '45).

7. On a sketch map of India, show the important regions of wool production, together with the centres of imported wool. Where is Indian wool mainly consumed? (C. U. B. Com. '41).

8. Discuss the present position and the future prospects of any two of the following industries in India:—

(a) Dairy-farming and Cattle-breeding, (b) Silk-producing and Silk-manufacturing, (c) Handspinning and handloom weaving, and (d) Fishing. (U. P. Board '44).

CHAPTER XII

1. Examine critically India's position for developing her key industries, emphasising mainly on the localisation of industries. (C. U. B. Com. '50).

2. "The present industrial renaissance in India is nothing short of the pangs of birth." Discuss the above in the light of the present world economy. (C. U. B. Com. '50).

3. Eastern Pakistan produces jute and West Bengal manufactures this, so that the position of jute is in a very anomalous position. What satisfactory measures would you suggest to cope with this anomaly? (C. U. B. Com. '50, '48, I. Com. '50).

4. What special advantages has Bombay Presidency for the establishment of cotton mills? Do you think Orissa and Assam are proper places for the development of cotton textile industry? (Delhi Prep. '50, C. U. I. Com. '49).

5. "The concentration of coalfields in one part of India is mainly responsible for the present location of industries in India." Do you agree? Give your reasons. (Delhi, B. A. Hons. '50).

6. India's Steel industry requires expansion. Besides Bihar and West Bengal, which other provinces can offer facilities for erection of Iron and Steel Works? Give your reasons. (C. U. B. Com. '49).

7. Examine the present position and the future prospects of the iron and steel industry of the Indian union. (C. U. I. Com. '50).

8. Describe the present position of chemical industry in India. In what direction is expansion possible in this industry? (C. U. B. Com. '43).

9. State briefly the nature of industrial development that has taken place in India as the result of the present war and why? (C. U. B. Com. '42).

10. To what extent is the industrialisation of India retarded by the lack of adequate supply of machine tools and power plants? State the present position of these industries in the country. (C. U. B. Com. '44).

11. Answer any two of the following:—

(a) How would you account for the fact that the silk industry has declined in Bengal but continues to develop in Kashmir and Mysore?

(b) What geographical factors have determined the distribution of the woollen industry in India?

(c) What is the future of the paper industry in India? (C. U. B. Com. '46).

12. Discuss the geographical as well as econonic factors favouring the growth and development of sugar industry (both beet end cane), giving an idea of the present position of sugar industry in India. (C. U. B. Com. '50).

13. What are the essential raw materials for the manufacture of cement? State the places where this industry is at present located in India and discuss its possibilities. (C. U. I. Com. '49).

14. Indicate the future of automobile and air-craft industries in India, mentioning the suitability of areas where they are intended for. (C. U. B. Com. '50).

15. Draw a map of India showing the location of principal manufacturing industries. (C. U. I. Com. '38, '39).

16. State briefly the present condition of the Indian Paper Industry Name the indigenous raw materials used for manufacturing paper and mention where they are found. (C. U. I. Com. '42, '50).

17. What are the principal Cottage Industries of Bengal? Give a short account of three such industries. (C. U. I. Com. '43).

18. Name the three principal industries of Bengal. State very briefly the circumstances which favoured their development. (C. U. I. Com. '45).

19. Do you think that India possesses all the advantages for the development of Automobile Industry? (C. U. I. Com. '45).

20. What do you understand by "Localisation of Industries"? Illustrate your answer by any two important Indian Industries. (C. U. I. Com. '47).

21. Write notes on the following industries of Bihar:—(a) Paper Industry, (b) Cement Industry, (c) Sugar Industry. (Pat. U. I. Com. '46).

CHAPTER XIII

1. On a sketch map of India, show the principal air routes both trunk and feeder in operation within the country. What new development do you expect in this sphere after the war? (C. U. B. Com. '44, '48, Delhi B. A. Com. '49, W. B. C. S. '49).

2. Describe the Raiway system of India, and show how the railways connect the principal producing and consuming areas. (C. U. I. Com. '33, '42).

3. For development of communication facilities in India, would you favour extension of Railways or construction of roads, or both? Give your reasons. (C. U. I. Com. '40).

4. Of the three types of transport, namely, road, river and railway, which one would be suitable for Bengal and why? (C. U. I. Com. '42).

5. Give a brief account of the different industrial activities which you will notice while travelling by rail from Digboi to Delhi *via.* Calcutta by the shortest route. (C. U. I. Com. '43).

6. You propose to go by rail from Amritsar to Jamshedpur *via.* Delhi and Nagpur. State the Railway systems over which you will travel and the commercial importance of these places. (C. U. I. Com. '47).

7. Give an idea of the railway route which you would suggest for linking up Assam with Calcutta without passing through Pakistan. (C. U. I. Com. '48).

8. Mention the principal airways of the world. Discuss the position of India in respect of air transport. (U. P. Board I. Com. '45).

9. Account for the importance of the following:—Jamshedpur, Vizagapatam, Jabbalpur, Patna, Tuticorin, Nagpur, Banaras, Chittagong, Dibrugarh, Ambala, Surat, Asansol and Bangalore. (C. U. I. Com. '42, '48).

10. Indicate the hinterlands of the ports of Bombay, Vizagapatam, and Calcutta. Also state the principal articles which are exported from these ports. (C. U. I. Com. '43, '47, C. U. B. A.. Hons. '49, Dacca Int. '40, Delhi Prep. '50).

11. On a sketch map of India locate the principal Ports of Kathiawar. What are the factors that have contributed to their growth in recent years? Discuss specially the development of Kandla.

12. It is said that Calcutta is one of the most expensive ports in the world. Do you share this view? State also your views on the proposal for connecting the port of Calcutta with the sea by a "Ship Canal." (C. U. B. Com. '47, '49).

13. Discuss the commercial importance of any five of the following: —Kalimpong, Dibrugarh, Kanpur, Karachi, Lahore, Jharia, Vizagapatam and Nagpur. (C. U. I. Com. '45).

14. Does Calcutta possess advantages for being situated on the river Hooghly? Give an idea of the hinterland of this port and the principal articles of export and import. (C. U. I. Com. '46, '50).

15. (a) The growth of Kanpur as an industrial centre in recent years, has been phenomenal. State the causes. (U. P. Board '45).

(b) Why was Jamshedpur selected by the Tatas for location of their Steel Company? What subsidiary industries have been established there? (C. U. I. Com. '46).

16. Name four ports of importance which a ship may touch on a coastal voyage from Bombay to Calcutta. Also, state the principal articles exported from these ports. (C. U. I. Com. '48).

17. Analyse the factors for the development of a port. Illustrate with examples from India. (Pat. U. I. Com. '46).

18. What is meant by "coastal shipping"? Name the ports of importance in India's coastal trade and state the position of Indian owned shipping companies in the coastal trade of the country. (C. U. B. Com. '48).

CHAPTER XIV

1. Write a short essay on the foreign trade of India stating (*a*) imports and their sources, and (*b*) exports and their destinations. (C. U. B. Com. '37, I. Com. '40, '48, '50, Dacca Int. '40).

2. Discuss the trend of India's exports to the U. S. A. What are India's imports from that country? Discuss the possibilities of expansion of this trade. (C. U. B. Com. '39, '41, '42, '43, Delhi B. A. Com. '49).

3. Mention briefly principles behind the various "Controls" over the foreign trade of India and discuss their effect on the economic life of the country. (C. U. B. Com. '43).

4. Mention the chief imports of India. Discuss the changes that have been brought about by the war in the foreign trade of the country. (U. P. Board '45).

5. Analyse the nature and direction of U. K. trade with Indian Union. (W. B. C. S. '49).

6. To what extent is the Indian Republic dependent on Pakistan for the supply of raw materials? Are there alternative sources available for such goods? (Delhi, B.A. Hons. '50).

7. Describe the nature of India's foreign trade across her land-frontiers. In which direction are there possibilities of expansion in this trade? (C. U. B. Com. '37, I. Com. '41).

CHAPTER XV

1. India has a population of about 320 millions. Analyse the factors which determine the irregular distribution of this vast population. (C. U. I. Com. '34, '50).

2. What are the reasons for the remarkable density of population in certain parts of India? (C. U. I. Com. '40, '42).

3. The density of population in Bihar per square mile is—646, in Baluchistan—9, in Madras States—631 and in Bombay Presidency—155. State the geographical factors responsible for such uneven density. (C. U. I. Com. '43).

4. On a sketch map of India, draw the areas of greatest and of least density of population. Also state briefly why the distribution of population is so irregular in India. (C. U. I. Com. '45).

5. "Political independence leads to economic independence." Critically examine this statement with reference to India. (C. U. B. Com. '45).

CHAPTER XVI

1. Give a brief account of the development and future of manufacturing industry in Pakistan.

2. Mention two industries which East Bengal can establish with advantage. Give your reasons. (C. U. B. Com. '49).

3. Discuss the possibilities of the development of Karachi and Chittagong. (C. U. I. Com. '44).

4. Fully discuss the hinterland and location of Chalna.

5. Give an account of the forest and animal resources of Pakistan.

6. Divide Pakistan into natural regions. Which of them is rich in minerals.

7. Draw a map of the two Pakistans showing railways and air routes.

8. Give an estimate of the food and commercial fibre resources of Pakistan.

9. Describe the irrigation systems of West Pakistan.

10. Write what you know about the development of hydro-electric projects in West and East Pakistan.

11. Give an account of horticultural development in West Pakistan. What special fruits are produced in East Pakistan?

12. Give an estimate of the foreign trade of Pakistan and its direction.