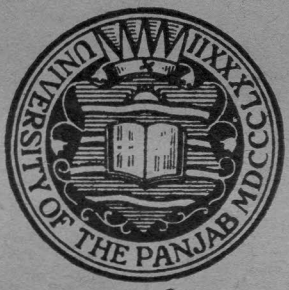
PAKISTAN GEOGRAPHICAL REVIEW

(Formerly Panjab Geographical Review)



1950

VOL. V

NO. 1

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JUTE, THE GOLDEN FIBRE

BY

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THOUGH the origin of Jute is a matter of controversy yet it is most likely that the plant is a native of South-East Asia. There is no doubt about the evidence of its being cultivated in India in the ancient times under the name of 'Pat'.

Before attaining its recognition as a textile fibre, Jute was mainly used for cordage and coarse fabrics material. Its use for bagging and packing in the 19th century was a turning point in the history of the fibre and an outstanding event of commercial importance for Jute cultivators and consumers. Its close similarity with hemp and flax lead to experiments at Dundee for its manufacture by mechanical means. The toughness of the fibre was a handicap which was overcome by the application of oil and water. As a result the fine fabric known as Hessian-cloth began to be manufactured in large quantities at Dundee. In India it remained as a handloom industry long after the Dundee Mills started producing Jute manufactured goods for export. In later years with the machenization of the Industry in India, the competition between the two centres, one in West Bengal, the other at Dundee, resulted in the new uses to which the Jute fabric could be put. Like all other raw materials it played its part in the war effort for it began to be used in the manufacture of canvas and tarpaulins and several other articles. Later years saw it in the form of curtains, upholstery, carpets and even dress materials.

About 98 per cent. of world Jute is grown in Indo-Pakistan while Pakistan has a virtual monopoly for growing 80 per cent. of the world crop and 100 per cent. of the fine quality Jute of the world. Its importance lies in its huge share of about 70 per cent. of the value of export from Pakistan. The greatest concentration of Jute is in the districts of Mymensingh, Dacca, Comilla,

Faridpur, Pubna, Bogra and parts of Rangpur. It occupies about 10 per cent of the total cultivated area in Eastern Pakistan. Among the districts of East Pakistan the greatest concentration and also the highest yields are obtained in Mymensingh. It is the largest district of East Bengal and grows over 25 per cent. of the total crop.

Jute being a regulated crop, its acreage is controlled. The year 1940-41 is generally taken as the basis for sanctioning the Jute acreage, during that year the Jute crop was biggest in recent years During 1948-49, 18,76,565 acres excluding Sylhet were cultivated with Jute against 20, 58,670 acres in 1947-48. The forecast for the year 1949-50 is 15,59,000 acres which registers a fell of 17½ per cent.

The yields in the two harvests after the emergence of Pakistan for 1947-48 and 1948-49 were 68,42,605 bales and 54,79,000 bales respectively.

The Indian dominion produces about 18 per cent. of the world Jute crop and that too of inferior quality. The chief areas of production are West Bengal, Bihar and Orissa. The total production in the first year after partition was 16,95,070 bales over an area of 6,45,685 acres while in the next year the total production rose to 2,000,000 bales. In the Indian dominion, the forecast for 1949-50 shows an upward trend in view of the self sufficiency policy because her present production cannot satisfy the demand of Indian Jute Mills. They require a minimum additional annual supply of 4,500,000 bales besides her own home supplies. In addition to Pakistan and India, there are other countries espacially in the Far East where Jute has been grown successfully to some extent over small areas. So far none of them could produce the fibre in large commercial quantities. The production being very irregular in these countries, the statistics are based on rough estimates.

Prominent among countries making efforts to produce Jute are Vietnam, China, Turkey, Iran, Japan, Farmosa, West Africa, Sudan, Egypt, Thailand, Java, Paraguay, Brazil and Maxico.

Of all these countries outside Indo-Pakistan, Farmosa has turned out to be most successful and the production amounted to about 30,000 tons in 1948 from a humble start of 2,615 tons in 1909. In China and Manchukuo the production is not negligible as compared to other countries with small productions. The comparison of statistics clearly brings out the leading position of Pakistan producing 80 per cent. of the total crop, India 18 per cent. and the rest of the world is left with only 2 per cent of the crop.

There are two main varieties of Jute, Capsularis and Olitoreous. Capsularis produces white Jute ranging in colour from white or cream colour to dark grey, but the colour is largely determined by the water in which it is retted. Olitoreous Fibre is softer to the touch and stronger than the white Jute and has golden yellow or dark grey colour. The plant in both the cases is an annual one and grows in a single stem without branchings or twigs though these may begin to develop as the plant nears maturity. The fibre is developed in best layer round the woody stick. The average height attained by the Jute plant is from 8 to 10 feet though heights of 16 feet have been recorded.

Environment.

The plant requires a special environment for its commercial growth. Jute plant needs high temperatures ranging from 70° F to 90° F ; too low temperatures reduce the size of the plant and also the yeild. The constant high temperatures are necessary throughout the growing period. In the case of the seed crop, a large number of sunny days are required for the ripening of seeds while for the fibre crop it is not essential as the fibre plant is harvested before it reaches full maturity.

The temperature requirements are adequately fulfilled by the low lying plains of East Bengal. Temperature here, rarely rises above 90° F and seldom falls below 70° F during the growing period from middle of February till October.

Rainfall.

Being a wet crop, it welcomes rainfall throughout its growing period, total amount on the average being

40 inches for that period. The proper operations in the field during its growth are carried on in the short dry spells of weather. Too much of rainfall and over-flooding damage the crop. There are three principal periods when the rainfall becomes essential (*a*) When the sowing has been completed and the plants are 2 feet high ; (*b*) When the crop is about to be harvested because ample water is needed for steeping and retting purposes. Apart from the periodic requirements of rainfall, the rainfall during a single week should be between 1" to 2".

In Eastern Pakistan in the Jute producing areas, the rainy season begins in June and continues for next four months so that the Jute plant matures with the full blast of the monsoons. More important than the temperature and rainfall requirements are the soil demands of the plant. The best soil for its growth is sandy loam or loam, which absorbs water and also retains it. Jute being a very exhausting crop, needs a yearly renewal of soils. Thanks to the large river system of East Bengal which bring new alluvium every year in abundance and manure the fields without any cost otherwise the very cost of manuring the fields for a cheap fibre like Jute would become a big problem.

It is to this fertile soil—a gift of the mighty rivers of Brahamputra and Ganges and their several distributeries that the East Pakistan owes the high density of Jute production and high yields. The influence of soil is so outstanding that it may be reflected even on the two banks of the river, slip off and dip-slopes. In Bogra there is a small stream known as Krotoa. It has an assymetrical Valley, the eastern bank slips gently to the river while the western bank has steep stops, with the result that the fields on the western parts receive less fresh alluvium and produce dwarf sized plants with low yields.

Though the density is quite high all over Eastern Bengal, yet the general pattern, that most of the fields are along the rivers and streams is maintained. The crop is thus very much prone to be affected by the shifts of channels which is quite usual. The Jute grower hence cannot be certain of his harvest. At any time the river may usurp his fields and sweep the crop along with itself.

The seeds are sown broadcast—after two or three ploughing with the advent of pre-monsoon showers generally known as 'Norwesters'. The sowing season depends upon the type of land and the variety of Jute to be sown. Capsularis, mainly a low-land crop is sown earlier than the Olitoreous. 10 lbs. of seeds are required for one acre of land in the case of the former while for the latter 8 lbs. of seeds may do.

It takes almost four months for the crop to mature after sowing and is subject to weather conditions and the variety of Jute sown. Usually the plants are harvested at the fruit formation stage—as this stage gives a soft but strong fibre usually with high yields. If delayed, the fibre becomes tougher and does not ret properly. Middle of June however is the earliest time for harvest and latest is the end of September or beginning of October. On the average 18 men are required to cut one acre in one day which usually yields 16 maunds of Jute fibre.

The stems even when cut are tied in bundles and left on the high ground to shed their leaves. Next stage is the steeping of stems, which is carried on in shollow water in which the bundles are fully submerged. It may be noted that water for steeping purposes should not be muddy. A few days later when steeping is complete, the bundles are taken out for stripping the fibre. This process consist of beating the root ends with the mallet the fibre being let loose at the crushed end, is held in both hands and with a jerking motion to and fro the fibre is stripped off completely. Unfortunately the smell of the plant at this stage is very unpleasent.

After extracting the fibre it is cleaned and finally the water is squeezed out. By this method a single man can secure $\frac{1}{2}$ maund of fibre in one day.

The fibre is transported to the uplands, and hung over bamboo frames to dry in the sun. If the weather is cloudy, the drying is done just in the open. In the clear weather when there is plenty of sunshine it only takes two or three days. A part of the crop is left standing for the purpose of seeds. Usually the farmers produce seed for their own needs. The surplus produced is sent to the Dacca market where it is tested and supplied to the cultivators who need it.

Like all other crops Jute is not free from hazards. The greatest enemy of Jute is the water Hyacinth. This vegetative plant attacks the low-lying areas. A little neglect on the part of the cultivator may result in the complete victory of this plant over the field. The farmer should always be on his guard to uproot the Haycinth whenever it appears.

Other enemies are stem rots, and black bands, which if not checked, damage the crop considerably. Among the pests and insects black weevil and Jute Hairy Caterpillars, feed on the Jute leaves and when there is dearth of leaves, they eat up the stems and ruin the crops.

After the fibre is dried it is made into bundles and is ready for the market. The profits of the cultivators are not large, as the fibre must pass through the several intermediaries, all of them out to make as much profit as possible. The return that the farmer gets is but a fraction of the price paid by the mills.

As Jute is a heavy substance and roads and railways are few and far between in East Bengal, almost all the transport is carried on by boats.

Exports.

The demand for all qualities of Jute covers all the raw material produced in East Bengal. Large quantities of the Jute fibre are exported from East Bengal for the manufacture of fine Hessians and Tarpaulins and special class of fine goods. The greatest consumers of raw Pakistan Jute uptil recently has been the Indian dominion.

While Pakistan holds a monopoly in the production of raw Jute, Indian dominion possess 100 per cent. of Jute Mills of Indo-Pakistan. The Industry in India remained in its initial stages for a long time. At that time when Dundee manufactured Jute goods were exported in large quantities Bengal had no fuel, no machinery, no skilled labour, so that the large scale manufacturing was impossible.

The opening up of Raniganj coal-fields lead to the idea of starting a Jute Mill on the bank of Hoogly. The

ball was set rolling in 1855, when the first Jute Mill was set up at Rishra. The First World War gave a strong impetus to the industry, while the Second World War helped no less but the post-war fall in the consumption of raw jute in Indian Jute Mills was conspicious from 67 lakh bales in 1942 to 58 lack bales in 1944. The export trade also decreased from its war-time level.

The year 1947 brought the Indian Jute Mill owners face to face with another serious problem, as the effects of partition were no less serious than the II World War.

The creation of Pakistan as a separate sovereign State, has substantially altered the position of India as a Jute growing and a Jute manufacturing country. The dominion of India was left with a small percentage of Jute crops that too of an inferior quality could not possibly feed the large consuming mills, which require a minimum of 4,500,000 bales a year, in addition to the home production.

70 per cent of the requirements of Indian Jute manufacture in Calcutta and West Bengal were imported from East Bengal. The rest of the raw Jute was exported through the port of Calcutta to all the foreign countries. This trade *via* Calcutta continued after the partition. Despite the fact that East Bengal provided the bulk of raw Jute before partition, no attempt was made to locate the Jute Mills in that area, nor did the port of Chittagong receive the attention it deserved, while West Bengal prospered by the export of the manufactured goods as well as the raw Jute through Calcutta. The dollar earnings, thus were a substantial help in the maintenance of a favourable balance of trade with the rest of world in the pre-partition days.

Even after the partition most of the raw Jute has been exported through Calcutta which has been earning huge custom revenues, which ought to have belonged to Pakistan. The damage done to the Jute crop of 1948 by excessive rains and floods consequently raised the Jute prices and the trend remained upwards throughout the year. In December 1948 the prices were quoted to be Rs. 35 per maund. In view of the high prices of raw Jute the loomage in Indian Mills had to be brought down by 12½ per cent. The total imports of raw Jute from East Pakistan to India during the season 1948-49 amounted to 4,132,503 bales by sea and by land.

The no-devaluation decision of Pakistan Government in September 1949 brought before the Jute Manufacturers a three-fold problem of raw materials, high prices of Jute goods and the substitutes. The devaluation decision on the part of India resulted in a deadlock of trade between the two new-born States.

As far as the question of raw materials is concerned Pakistan is the only place from where India can import raw jute at cheap rates in large quantities. But in view of the upward trend of prices in 1948-49 the Indian Government in conjunction with Jute Mill Association fixed a maximum price of Rs. 35 per maund for all qualities of raw Jute and the open general licences for export of raw Jute was cancelled without any hesitation. No one was allowed to import raw Jute at above the fixed rate. In view of the hesitation on the part of India to lift high priced Pakistan Jute, Pakistan seriously thought of fixing a minimum price for Jute. The accumulation of Jute stocks might have resulted in a rapid fall of prices but the fixation of a minimum price of Rs. 32 per maund saved the growers from a disastrous crisis. All Jute purchases were made by the companies and licenced marchants, with substantial aid by the Government of Pakistan in the form of opening up of the National Bank of Pakistan. The minimum price fixed was equal to Rs. 45 in Indian Currency. India was quite unwilling to accept the new rates and uptil now no amicable decision has been reached between the two countries.*

The effects of this deadlock are serious and far reaching. It is reported that even if Pakistan held her jute Indian Mills will have sufficient Jute stocks till next Jute season. The above statement is merely based on the successful smuggling of Jute that had been taking place during the few months after the non-devaluation decision. Certain reports state that upto 1,000 maunds of Jute have been smuggled a day mainly by air. Large scale anti-smuggling measures were taken by Pakistan which are now effective to a great extent.

* Since this article was written, the situation has changed. By a trade agreement in April 1950, Pakistan is to supply 800,000 bales of raw jute to India on a special monetary basis.

In view of the present conditions India is trying to produce the maximum supplies of Jute in her own dominion. Government is helping the growers by distributing free seeds. The project of self-sufficiency cannot easily be given substance to but it is possible that the areas under production will be expanded in West Bengal, Bihar and Orissa while new lands will be brought under this crop in Madras and Bombay presidencies. Even according to the plans of Indian Government, if they materialize in full, India will remain deficient by at least 36 lakh bales.

While the devaluation decision resulted in the enthusiastic measures taken in view of the self-sufficiency policy by India, in Pakistan the effect were no less important. Export of raw Jute *via* Calcutta was stopped, and Chittagong port came into the forefront. It is receiving the full attention of the Government of Pakistan to provide railway and port facilities for the handling of Jute. Efforts to increase direct loading of cargoes at Chittagong from wagons into ships are being made ; hydraulic cranes and mechanically operated trolleys be provided for the Jute transit.

It is necessary in view of the existing conditions that the movement of raw Jute from the producing centres to the terminus markets must be as quick as possible. For river-cum-sea service, a necessary Flotilla has been recommended so that the movement of Jute may be uninterupted throughout the year. The present condition of communications is highly unsatisfactory. The demand for transport would be much in excess of the over all capacity hence private enterprise should be encouraged, to supplement the river and rail capacities.

Apart from these developments, Pakistan cannot go on exporting raw Jute for long. It must have her own Jute Mills and should export Jute goods in finished forms, that would serve as the foundation stone for long range industrialization of the State. The existing baling capacity of East Pakistan is estimated to be 6,690 bales per day. The total number of pucca presses is only 33. There are about 2,000 Kacha presses, but these cannot cope with such large quantities of Jute. Besides increasing the baling capacity the Government has recommended the

setting up of three Jute Mills with a total loomage of 3,000. Mere recommendations of these mills and even their installation is not enough. It will take a long time to industrialise East Pakistan fully. At present we have to look to other countries for the export of raw jute, our commercial relations with India being almost severed.

At present the important buyers of Pak raw Jute are U.K., U.S A., France, Italy, Belgium, Brazil and Argentina.

United Kingdom used to import about 20 per cent. the quantity exported from Indo-Pakistan. Dundee is the largest jute manufacturing centre in U.K. and the annual consumption of the mills is about 1 m. bales, superior varieties from East Pakistan forming about 60 per cent. of the total, the balance is being made up by Indian varieties. The bulk of U.S.A demand consists of East Pakistan fine variety Jute, a small amount is imported from India. The total requirements fluctuate between 60,000 and 80,000 tons annually.

Germany.

Pre-war average of imports of Germany were 150,000 tons. After 1936, the mixing of Jute with other fabrics made from straw and wood reduced the Jute off-takes considerably. Germany mainly imported inferior quality of Jute from India, with a small quantity of Tosso and Desi from East Bengal.

France.

Average consumption of pre-war times was 79,000 tons. As most of the Jute imports in France are used the production of containers for agricultural produce, the bulk of imports are made up of inferior Indian Jute. Only a very limited quantity of white Jute is imported. The reorganisation of the Industry has begun to figure fine jute imports in greater quantities.

Italy.

The Jute Industry in Italy dates back to the First World War after which the industry developed rapidly producing superior standard goods there in the form of Carpets, Hessian and Lenoleum, Hemp is mixed with Jute to produce fine goods.

Belgium imports mostly white Jute of East Bengal and the total comsumption is 45,000 tons.

Notable among other Jute manufacturing countries which import our Jute are Australia, Poland, Czechosolovakia and Scandinavian countries.

During the entire period of 1948-49 Burlap markets all over the world were extremely distressed by the fluctuations both in prices and export controls on raw jute and jute manufactures from shipping centres in Pakistan and India. In view of the high prices of Jute, difficulties in obtaining regular supplies of raw materials and its commercial importance, there was a strong tendency in many countries of the world towards securing alternative source of supply of the raw materials. Inspite of experiments no complete substitute for Jute has yet emerged. During the war two types of substituted were developed—Fibrous and non-fibrous substitutes were such to which Jute machinery could be readily adopted non-fibrous substitutes developed mainly during emergency periods.

Sisal Hemp is used on a large scale in U.S.A. for the production of Ropes, Cordages, Carpets and mattings. It has been produced successfully in Mexico, Africa and Yucatan. Outside U.S.A. this fibre has not been used so enthusiastically as it cannot be adopted easily by Jute mills.

Other fibres of the hemp family have been tried but without much success, because they are highly expensive and cannot compete with the cheap jute fibre.

Rosella Plant, in Java yielded enongh fibre for the sugar bags. Kanaf of China and Manchukuo are mixed with Jute, to turn out bags for their rice and soya beans.

U.S A. produced a non-fibrous packing material during the war known as Multiwall Paper. Five layers of tough papers were gummed together and fastened at the corners with wire stiffeners. The defect lies in its short life and lesser strength as compared to Jute Bags. There were a large number of industries which conducted extensive research to produce a complete substitute that would replace Burlap. In view of this analysis of

substitutes it can be safely said that none of them seems to afford a serious competition to Jute. Jute demand in the world is based on its very cheapness and being the most suitable packing material. The importance of stabilizing the Jute prices at reasonable and economic levels, in relation to the other packing materials has been fully realised. It is high time therefore to initiate research with a view to reducing the cost of production to the minimum possible, if the prices keep low, no country in the world will be able to oust Jute from its markets.

It may be summed up that in a densely peopled region like East Pakistan availability of cheap labour being no consideration, the problems at present are :

(*i*) Establishment of Jute manufactures.

(*ii*) Development of Transport facilities.

The future of the industry seems no less bright if carried on under careful planning. Jute as well as Jute manufactures will continue to find ready markets in the world.

CHOICE OF PAK CAPITAL

A POLITICO-GEOGRAPHICAL ANALYSIS

BY

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THE all important question of the choice of a capital for the State was attracting the speculation of keen observers at the time when Pakistan was yet in the offing. Some people were thinking on the old lines of selecting an up-country centre for the State Headquarter. There were suggestions of raising a new capital some where between Rawalpindi and Abbottabad, and the like, which were based only on superficial considerations.

The choice of Karachi for the purpose is partially justifiable on sentimental grounds as it happens to be the birth place of the Father of the Nation. Similarly it may be said that Karachi has not been the seat of Government of any kingdoms in the past. Its freedom from history makes it the fittest place for the evolution of unbiased and new traditions in a new State. But apart from these minor considerations there are important politico-Geographical factors which determine the metropolitian character of the city. From the point of view of internal and external relations, the successful maintenance of which is one of the main functions of the Capital, the selection of Karachi was unquestionably judicious.

The creation of our State with its two limbs being distantly disposed at the eastern and western peripheries of the sub-continent of Indo-Pakistan was a unique phenomenon in the historical annals of the world. It gave rise to a particular shape of the country for which no descriptive word is easily available in current terminology. It may, however, be best called 'Disjunctive'. This disjunctive shape of the territory has merits and demerits of its own. The situation of the two wings of the State on the two most important margins of the sub-continent determines the very great strategic importance of Pakistan. On the other hand, had it not been for the most effective unifying

element of religious ties, this shape could easily have operated against the very national unity. On the whole it can be said that it is more favourable than unfavourable.

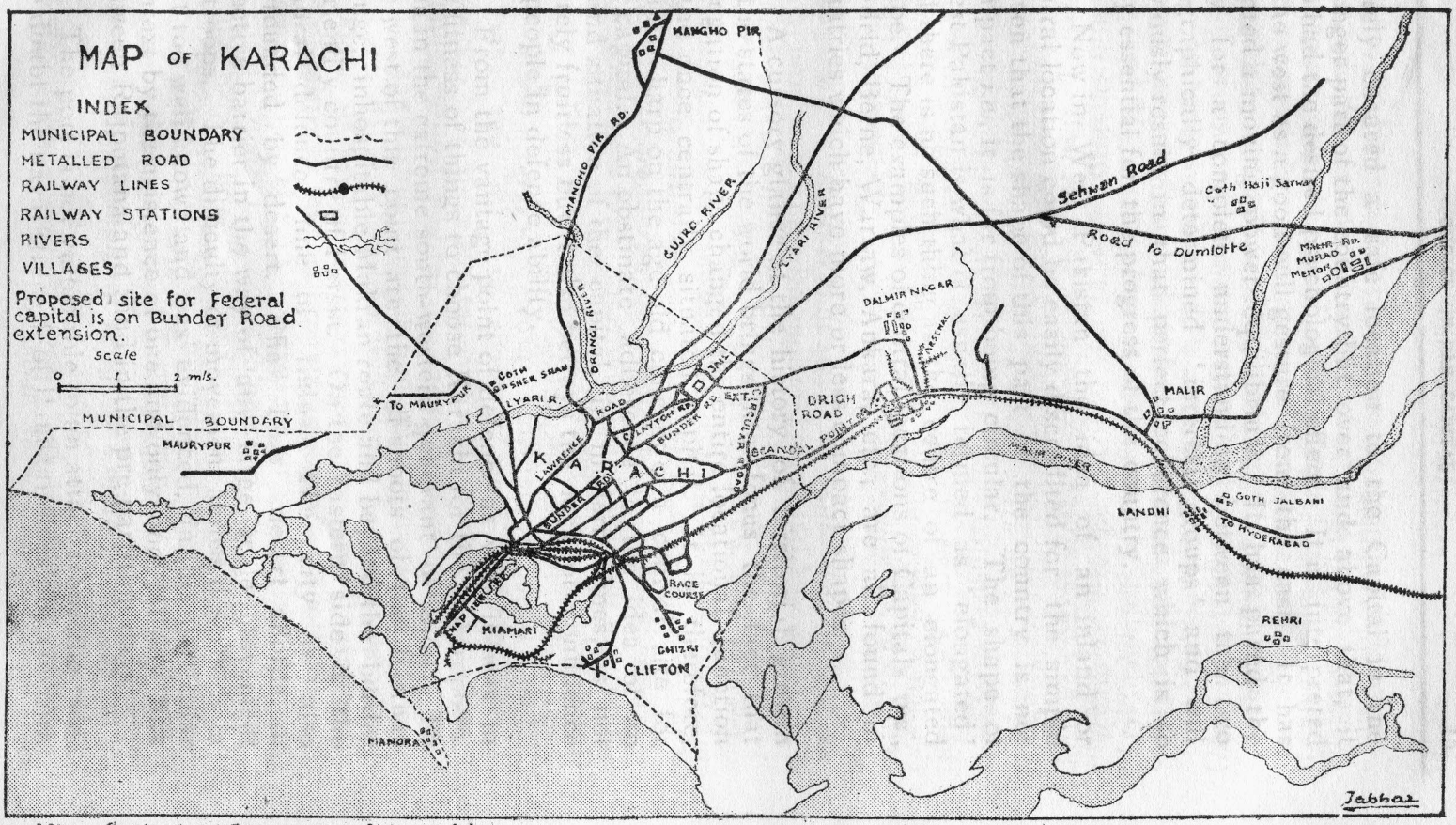
The humid east (East Pakistan) and the arid west (West Pakistan) give a balanced economy to Pakistan. A great variety of products which has emanated from the particular set-up of the diverse environmental conditions of the east and the west ensures greater amount of self-sufficiency and better prospects of international trades. This in turn will result in greater prosperity and more unequivocal support of the people to the State.

The difficulty, anyhow, arises from the fact that there is a very unequal distribution of population in the two parts of the country. Eastern Pakistan with an area of only 54,030 sq. miles is thickly peopled by no less than 46,720,000 persons while the comparative vastness of 306,977 sq. miles contains a population of only 33 540,000. This disparity of population between the east and the west exists today and there are chances of its being augmented tomorrow. It is not merely a numerical question. It has a great bearing on the internal relations of the State. Many examples of states may be cited in which the disparity of population pattern coupled with the influence of distance has resulted in internal dissentions. Brazil furnishing the most convincing one.

In Pakistan the problem is all the more complicated owing to the fact that the thinly peopled west contains Punjab, 'The sword arm of Pakistan' and N. W. F. P.* 'The Land of Men' with their long military traditions and Sind and Baluchistan with their stout inhabitants. So, on the one hand we find numerically strong east and on the other hand militarily strong west. In the democratic process of counting the heads, however, east enjoys a more privileged position than the west.

This position brings into eminence the question of maintaining a favourable balance of power and balance of privileges between the two counter-parts. The task could be best accomplished by locating the Capital—the hub of all the important State activities—in the west. It has not

*"When the British Soldier crossed the Attock he know that he was in the land of men".—F/M. Auchinleck.



After Geology & Geography of Karachi.

merely ensured a safe location to the Capital in the stronger part of the country but, over and above that, it has had the desired psychological effect. It is interpreted in the west as a good-will gesture from the east. It has created a moving power equilibrium. It has paved the way for a complete understanding between the two geographically determined 'interest groups' and will obviously result in that perfect coherence which is so very essential for the progress of the country.

Now in West Pakistan the idea of an inland or central location could be easily discredited for the simple reason that the shape of this part of the country is not compact *i.e.*, it is far from being circular. The shape of West Pakistan is what is usually termed as 'elongated' and there is no such thing as the centre of an elongated shape. The examples of central locations of Capitals *viz.*, Madrid, Berne, Warsaw, Ankara, etc., are all found in countries which have more or less compact shapes.

A cursory glance at the history of territorial growth of the states of the world brings into focus the fact that elongation of shape changed the entire locational function of the once centrally situated capital. It is, therefore, futile to harp on the age-old concept of a central site for the capital. An obstinate adherence to the idea of an inland situation of the capital, in modern times, is not merely fruitless but it also betrays the lack of confidence of people in defence ability.

From the vantage point of defence as well it was in the fitness of things to choose Karachi for the metropolis. It is in the extreme south-western quadrant of Sind. To the west of this point are the off-shoots of the Kirthar Range, inhospitable Makran route and beyond the border a friendly country of Persia. On the eastern side is the natural defence line of Indus. The city is also surrounded by desert. The Thar desert affords an effective barrier in the way of any large scale movement of troops. The difficulty of movement across deserts is a fact too well known and was evidenced, in this particular context by the existence of one and only one railway link between Rajputana and Sind in the pre-partition days.

The port is not vulnerable to an attack from the sea. No doubt the naval strength of Pakistan does not vie with

those of the important sea-powers of the world but the length of coast to defend, about 850 miles (W. Pakistan 500 miles, East Pakistan 350 miles), is also proportionately small. Karachi is safer than other ports of the coast in so far as it is the principal naval base of Pakistan. Aside from it land fortifications have also proved effective in foiling any attack from the sea. The effectiveness of land fortifications is clearly borne out by the glaring example of Dardanelles. In case of a real danger Manora and Keamari, can be fortified to provide protection from frontal naval attack. Karachi is, therore, well protected like Southanpton or Hamburg. It may be said that in the event of an air attack there is only one entrance to the interior provided by the railway bridge near Malir but the very idea of an unsystematic escape from the scene of bombardment is too unimaginable and unbecoming to be considered here.

This brief analysis shows that Karachi is strategically well disposed but considerations others than strategic are also important. Keeping in view our responsibilities towards East Pakistan and our relations with the Middle Eastern Muslim powers and Indonesia we cannot afford to ignore maritime interests. Inspite of the preponderana of the land frontier of our State as compared to the sea frontier the orientation of our trade and commerce is still towards sea. The present trade deadlock between India and Pakistan and the deteriorating commercial connections with Afghanistan prove beyond doubt that we should look more towards sea for our economic and other benefits. Maritime interests are also conducive to a universal stand point, to a 'world-view' which is exactly in keeping with our Islamic preachings. These interests, however, can be best achieved through a coastal capital. There is no better indication of the international outlook of a state than the situation of its capital on or near the coast. This is exemplified in the cases of Stockholm, Oslo, Lisbon, Rio, de-Janeiro, Tokyo and London and also in a slightly different way in the situation of U.N. Headquarters at Lake Success.

Karachi imbibes in us a global view-point as it brings Pakistan into direct contact with the rest of the world. It is at the cross of air routes. Airways

from Basra, Jask (Persia), Bahirein, Sharjah (Oman), Bengalore, Bombay, Ahmadbad, Calcutta, Delhi, Lahore and Zahidan *via* Quetta all converge here. It is on the main B.O.A.C. service between U.K., India, Singapore, and Sydney. Indo-Pakistan air-transport agreement of June 1948, makes provision for 17 routes five of which extend beyond India and Pakistan. In this air age the importance of such a position as that of Karachi can never be under estimated. It enjoys an approximately central location in Afreurasia. It is in a position to feel the pulse of events, to understand the temperament of current politics and particularly to exchange views with the world. The diffussion of external and internal thought advances culture which in turn strengthens the nation.

Another implication of the convergence of airways at Karachi is not easily appreciated by some persons though it is of a tremendous importance. The revolutionery influences of air navigation are fast changing geographical values. A new world is in the process of formation, a world which is shrinking and in which, eastern and western hemispheres are constantly being drawn nearer and nearer. This ever increasing nearness of the two hemispheres is tending to give Iceland, a focal position in the world. The relative importance of different cities will soon begin to be determined in terms of their distances from Iceland. Karachi is nearest to Iceland than any other important port of Asia, the great circle distances, *i.e.*, shortest distances from Iceland to Karachi, Aden, Bombay, Calcutta, Singapore, Canton, Shanghai and Port Arthur being 4530, 4639, 5064, 5269, 5384, 5828, 5454 and 4937 miles respectively (*vide* Appendix I). This is going to change the fate of Karachi. The present gateway of West Pakistan is destined to become, one day, the gateway of Asia.

Another bright aspect of the situation is that the growth of Karachi will continue to take place unhindered by competition from any other rival city as there is no evidence of rapid urbanisation in Sind. Sind has, on the contrary, been known for the unstability of settlement owing to its changing hydrography, exhausting supplies of drinking water, shifting sands, changing climates etc. It is, thus, for the purposes of settlement, a region of adversities. Growth under adverse circumstances is difficult but if it rarely takes place it becomes abnormal

as some trees in Sudan Region attain abnormal dimensions. The same exceptional growth or progress is exhibited in the case of Karachi. An increase in its population from 10,000 in 1843, to nearly 5,35,000 in 1945, and to about 12 lakhs in 1950, is really phenomenal although the influx of refugees from India is also responsible for the steep rise in its population after 1947.

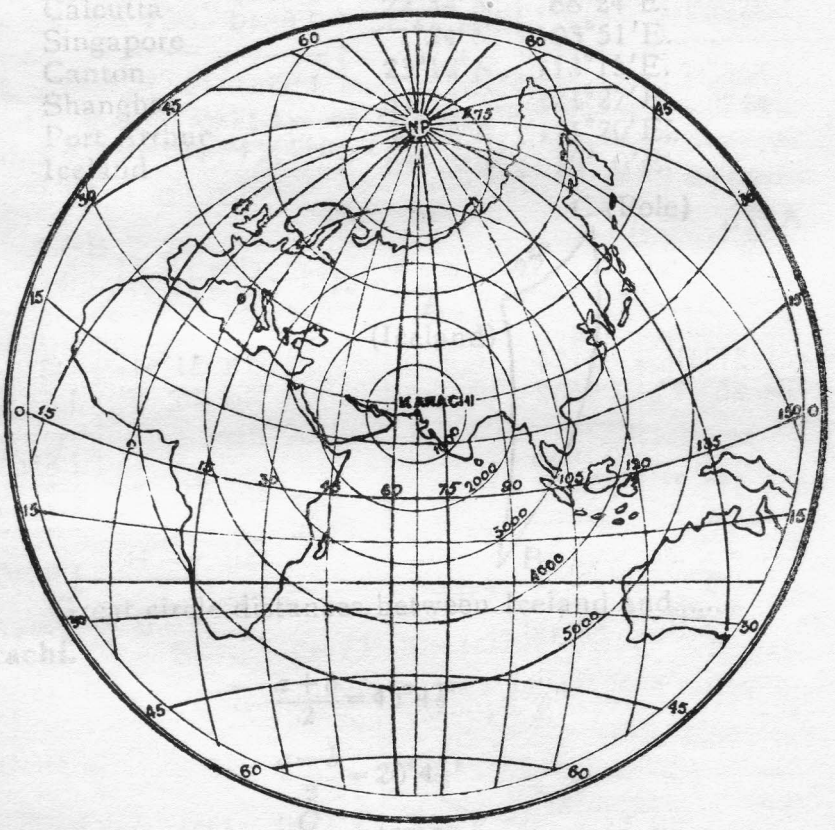
A very fortunate thing about Karachi is its location to the West of Indus Delta, which is gradually expanding towards east. The prevalent direction of sea currents is mostly from west to east. The load of the river discharged at its mouths is, thus, carried away by the currents towards east. All this makes Karachi harbour safe from sedimentation which has made harbours like those of Surat and old Venice dwindle into un-importance. The harbour was protected from the south-west storms by the construction of break-waters in 1873. The present position of the port is very satisfactory. The Ministry of Industries' report on Transport and Industry says* 'West Pakistan is fortunate in possessing the port of Karachi with adequate facilities to meet all the immediate foreseeable requirements.' These improvements of the port facilities have restored Karachi, commanding a vast hinterland extending upto Afghanistan, to its rights.

The advantages of the site of Karachi are not unmixed with some slight disadvantages. There is a restricted number of sizable green patches in or around the city. The climate is humid and the availability of drinking water is problematic. These minor factors, any how, cannot stand in the way of progress of the city. The construction of Kotri Barrage and western canal will soon obvigate the water problem and the new site of the federal capital on the extension of Bunder Road will not be suffering from high humidity.

From what has been discussed above it may be concluded that there was perfect justification in the selection of Karachi as the capital. Sir Charles Napier was right in designating 'Karachi' as the 'Glory of the east' in 1847, though it took a period of one century to prove how porphetical his words were.

*Transport and Industry, Page 10, published by the Ministry of Industries.

KARACHI IN THE CENTRE OF THE OLD WORLD

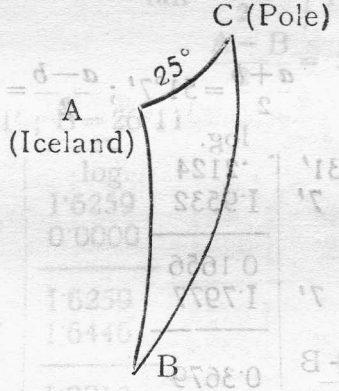


R.F., 1:250,000,000
Circles around KARACHI give distances in miles (vide appendix II)

APPENDICES

I

City	Approx. Co-ordinates.
Karachi	24°51′N. ; 67° 4′E.
Aden	12°46′N. ; 45° 2′E.
Bombay	18°54′N. ; 72°49′E.
Calcutta	22°34′N. ; 88°24′E.
Singapore	1°24′N. ; 103°51′E.
Canton	23°12′N. ; 113°15′E.
Shanghai	31°13′N. ; 121°27′E.
Port Arthur	38°48′N. ; 121°20′E.
Iceland	65° 0′N. ; 18° 0′E.



Great circle distances between Iceland and.....

Karachi.

$$\frac{a+b}{2} = 45°4\tfrac{1}{2}'$$

$$\frac{a-b}{2} = 20°4\tfrac{1}{2}'$$

$$\frac{C}{2} = 42°32'$$

	log.		log.
cot 42°32′	0374	cot 42°32′	·0374
cos 20° 5′	I·9727	sin 20° 5′	I·5358
	0·0101		I·5732
cos 45° 5′	I·8488	sin 45° 5′	I·8501
$\tan \frac{A+B}{2}$	0·1613	$\tan \frac{A-B}{2}$	I·7231

$$\frac{A+B}{2} = 55°24' \qquad \frac{A-B}{2} = 27°52'$$

$A = 83°16'$; $B = 27°32'$

	log.
sin 25°	Ī·6259
sin 85°4′	Ī·9984
	Ī·6243
sin 27°32′	Ī·6649
sin c	Ī·9594

$c = 65°36' = 1·1449$ redians

Distance $= 3957 \times 1·1449 = 4530$ miles

Aden.

$$\frac{a+b}{2} = 51°7' \; ; \; \frac{a-b}{2} = 26°7' \; ; \; \frac{C}{2} = 31°31'$$

	log.
cot 31°31′	·2124
cos 26° 7′	Ī·9532
	0·1656
cos 51° 7′	Ī·7977
tan $\frac{A+B}{2}$	0·3679

$\frac{A+B}{2} = 66°48'$

	log.
cot 31°31′	·2124
sin 26° 7′	Ī·6437
	Ī·8561
sin 51° 7′	Ī·8912
tan $\frac{A-B}{2}$	Ī·9649

$\frac{A-B}{2} = 42°41'$

$A = 109°29'$; $B = 24°7'$

	log.
sin 25°	Ī·6259
sin 63° 2′	Ī·9500
	Ī·5757
sin 24° 7′	Ī·6113
sin c	Ī·9646

$c = 67°11' = 1·1726$ radians

Distance $= 3957 \times 1·1726 = 4639$ miles

Bombay.

$$\frac{a+b}{2} = 48°3' \; ; \; \frac{a-b}{2} = 23°3' \; ; \; \frac{C}{2} = 45°24\tfrac{1}{2}$$

	log.		log.
cot 45°25′	Ī·9936	cot 45°25′	Ī·9936
cos 23° 3′	Ī·9639	sin 23° 3′	Ī·5928
	Ī·9575		Ī·5864
cos 48° 3′	Ī·8251	sin 48° 3′	Ī·8714
$\tan \frac{A+B}{2}$	0·1324	$\tan \frac{A-B}{2}$	Ī·7150
$\frac{A+B}{2}$	= 53°36′	$\frac{A-B}{2}$	= 27°25′

$$A = 81°1' \; ; \; B = 26°11'$$

	log.
sin 25°	Ī·6259
sin 90°49′	0·0000
	Ī·6259
sin 26°11′	Ī·6446
sin c	Ī·9813

$$c = 73°18' = 1·2793 \text{ radians}$$

$$\text{Distance} = 3957 \times 1·2793 = 5064 \text{ miles}$$

Calcutta.

$$\frac{a+b}{2} = 46°13' \; ; \; \frac{a-b}{2} = 21°13' \; ; \; \frac{C}{2} = 53°12$$

	log.		log.
cot 53°12′	Ī·8740	cot 53°12′	Ī·8740
cos 21°13′	Ī·9696	sin 21°13′	Ī·5586
	Ī·8436		Ī·4326
cos 46°13′	Ī·8401	sin 46°13′	Ī·8585
$\tan \frac{a+b}{2}$	·0035	$\tan \frac{a-b}{2}$	Ī·5741
$\frac{a+b}{2}$	= 45°14′	$\frac{a-b}{2}$	= 20°34′

$A = 65°48'$; $B = 24°40'$

	log.
sin 25°	I·6259
sin 106°24′	I·9820
	I·6079
sin 24°40′	I·6204
sin c	I·9875

$c = 76°18' = 1·3317$ redians

Distance $= 3957 \times 1·3317 = 5269$ miles.

Singapore.

$\frac{a+b}{2} = 56°48'$; $\frac{a-b}{2} = 31°48'$; $\frac{C}{2} = 60°50\frac{1}{2}'$

	log.		log.
cot 60°51′	I·7464	cot 60°51′	I·7464
cos 31°48′	I·9294	sin 31°48′	I·7218
	I·6758		I·4682
cos 56°48′	I·7384	sin 56°48′	I·9226
$\tan \frac{A+B}{2}$	I·9374	$\tan \frac{A-B}{2}$	I·5456

$\frac{A+B}{2} = 40°53'$ $\qquad$ $\frac{A-B}{2} = 19°21'$

$A = 60°24'$; $B = 21°32'$

	log.
sin 25°	I·6259
sin 121°51′	I·9291
	I·5550
sin 21°32′	I·5647
sin c	I·9903

$c = 77°57' = 1·3605$ radians

Distance $= 3957 \times 1·3605 = 5384$ miles.

Canton.

$$\frac{a+b}{2}=45°54'\ ;\quad \frac{a-b}{2}=20°54'\ ;\quad \frac{C}{2}=65°37\tfrac{1}{2}'$$

	log.		log.
cot 65°38′	Ī·6560	cot 65°38′	Ī·6560
cos 20°54	Ī·9704	sin 20°54	Ī·5523
	Ī·6264		Ī·2083
cos 45°54′	Ī·8426	sin 45°54′	Ī·8562
$\tan\frac{A+B}{2}$	Ī·7838	$\tan\frac{A-B}{2}$	Ī·3521

$$\frac{A+B}{2}=31°18'\qquad \frac{A-B}{2}=12°41'$$

$$A=43°59'\ ;\ B=18°37'$$

	log.
sin 25°	Ī·6259
sin 131°15′	Ī·8761
	Ī·5020
sin 18°37′	Ī·5041
sin c	Ī·9979

$c=84°24'=1·4731$ radians

Distance $=3957\times 1·4731=$ *5828* miles.

Shanghai.

$$\frac{a+b}{2}=41°53\tfrac{1}{2}'\ ;\quad \frac{a-b}{2}=16°53\tfrac{1}{2}'\ ;\quad \frac{C}{2}=69°43\tfrac{1}{2}'$$

	log.		log.
cot 69°44′	Ī·5673	cot 69°44′	Ī·5673
cos 16°54′	Ī·9808	sin 16°54′	Ī·4634
	Ī·5481		Ī·0307
cos 41°54′	Ī·8718	sin 41°54′	Ī·8247
$\tan\frac{A+B}{2}$	Ī·6763	$\tan\frac{A-B}{2}$	Ī·2060

$$\frac{A+B}{2}=25°23'\qquad \frac{A-B}{2}=9°8'$$

$A = 34°31'$; $B = 16°15'$

	log.
sin 25°	Ī·6259
sin 139°27′	Ī·8129
	Ī·4388
sin 16°15′	Ī·4469
sin c	Ī·9919

$c = 79° = 1·3788$ radians

Distance $= 3957 \times 1·3788 = 5456$ miles

Port Arthur.

$$\frac{a+b}{2} = 38°6' \; ; \; \frac{a-b}{2} = 13°6' \; ; \; \frac{C}{2} = 69°40'$$

	log.
cot 69°40′	Ī·5689
cos 13° 6′	Ī·9885
	Ī·5574
cos 38° 6′	Ī·8959
tan $\frac{A+B}{2}$	Ī·6615

$\frac{A+B}{2} = 24°38'$

	log.
cot 69°40′	Ī·5689
sin 13° 6′	Ī·3554
	Ī·9243
sin 38° 6′	Ī·7903
tan $\frac{A-B}{2}$	Ī·1340

$\frac{A-B}{2} = 7°45'$

$A = 32°23'$; $B = 16°53'$

	log.
sin 25°	Ī·6259
sin 139°20′	Ī·8140
	Ī 4399
sin 16°53′	Ī·4630
sin c	Ī·9769

$c = 71°28' = 1·2473$ radians

Distance $= 3957 \times 1·2473 = 4937$ miles.

II Lengths of radii for circles showing distances from Karachi on the map entitled 'Karachi in the centre of Afreurasia'

Distance in miles.	Length of radious in inches.
1,000	·25
2,000	·52
3,000	·80
4,000	1·11
5,000	1·46

ABBASIA CANAL PROJECT, BAHAWALPUR STATE.

DEPTT. OF IRRIGATION, BAHAWALPUR STATE.

From Panjnad Head Works situated just below the confluence of Sutlej and Chenab Rivers takes off the Panjnad Canal which irrigates 1,246,552 acres of land in the South-western District of Rahimyarkhan in Bahawalpur State. Of this 884,990 acres chiefly lying between the River and the Lahore-Karachi Railway Line get non-perennial supply and 361,562 acres generally lying to the South-west of the Railway Line from near Khanpur to the Western end of the State are irrigated perennially.

This canal has a discharge of 8,000 cusecs in Kharif for both the non-perennial and perennial areas and 1,500 cusecs in Rabi for its perennial area. The discharge actually required according to the detailed capacity statement of the canal works ought to be 8,800 cusecs in Kharif and the difference is made up by closing down the channels in rotation.

The perennial distributaries require a discharge of 1,750 cusecs while actually they get about 1,100 cusecs, deducting 400 cusecs out of 1,500 cusecs at the Head of the canal due to absorption losses in the main canal and branches. The deficiency is similarly made up in Rabi by rotational running of the channels.

Another canal called Abbasia also takes off from Panjnad and provides non-perennial irrigation to 36,981 acres of land between its Head and the Railway Line which it crosses near Chanigoth Railway Station.

As stated above out of 1,500 cusecs which Panjnad Canal gets in winter about 400 cusecs are lost in the beds of main canal and branches through absorption before the water gets into the heads of the perennial distributeries which lie at considerable distances from the Head of the main canal. This is also causing rise in the water table along the main canal and branches and thus threatening water-logging over extensive areas while it has already appeared in a serious form in the first 20 miles of Panjnad Canal.

To save this valuable water from being wasted and also causing ruination of large areas by water-logging it

is now proposed to provide a lined canal from Panjnad to the heads of all the perennial distributeries and from the water thus saved extend perennial irrigation in the Crown Waste Lands.

The lining of the existing main canals and branches which carry much bigger discharges in summer for the non-perennial area will be extremely expensive besides the difficulty of carrying out the work on account of the channels being in operation and doing irrigation. It is, therefore, proposed to reconstruct as a lined channel for Abbasia Canal through the Crown lands to irrigate them on the way and to extend it to join with the Heads of all the existing perennial distributaries lying more or less along the Railway Line between Lhanpur and Rahim Yar Khan. With the construction of this lined canal about 350 cusecs out of the present absorption losses in winter will be saved which will provide water for the extension of irrigation in the Crown Waste lands.

The Panjnad Canal will then become entirely non-perennial and the Abbasia Canal getting all the Rabi supply will irrigate the existing perennial areas of the Panjnad Canal as well as provide extension of irrigation to the Crown Waste areas. Irrigation will, thus, be provided to 2,50,000 acres of new Crown Waste land.

The construction of 94 miles of lined canal from Panjnad Headworks to near Rahimyarkhan will cost about Rs. 1½ crores and take four to five years to complete. Due to difficulty of obtaining materials as well as finances to carry out the Project it was decided to divide the Project into two stages.

Stage I.

Stage I comprises construction of Abbasia Canal as an earthen channel to start with for a smaller discharge than ultimately required. In addition to irrigating a narrow strip of land adjacent to the existing irrigated tract it will also carry, in Kharif, a part of the supply required by the existing perennial channels of the Panjnad System, the object being to run the newly constructed earthen channel as a Feeder canal for staunching its banks and growing silt berms for the lining proposed in Stage II to set on. Compaction of banks of a newly constructed earthen channel for the lining to rest on is

the most important and difficult job. If this work is not satisfactorily carried out failures of lining are the results. A large part of the Abbasia Canal passes through the desert where due to difficulty of obtaining water the compaction of banks for lining will be most difficult and also the cost prohibitive. In some reaches the soil being soft is not suitable for compaction and will not provide suitable fill behind the lining. By running the canal in Kharif for a few years good silt berms will be formed providing an excellent compact back for the lining.

Another advantage is that water will be available along the entire length of the canal in the desert for the brick burning required for lining which otherwise would be a most difficult problem.

Lastly the running of the canal will transport sand from the river along the whole length of the canal in its bed and thus provide washed sand for the lining at the site of work. Transportation of sand over long distances in the desert by other means would be very expensive.

In designing the earthen canal of Stage I an effort has been made to run such discharges and adopt such section of the canal in different reaches which, when lined, will suit the dimensions required for a lined channel of the final capacity. To put it by way of illustration, an earthen channel to carry 2,200 cusecs which the Abbasia Canal will ultimately take at Head, a bed width of 105′ to 110′ is required. The designed bed width for a lined channel to carry this discharge will be less than half of this. Due to less friction at the bed and sides the velocity in a lined channel is greater than in an earthen channel. The section of a lined channel is, therefore, much less than of an earthen channel to carry the same discharge resulting in considerable savings in earth-work and land.

A canal with 45 ft. bed width will carry about 1,000 cusecs and the Abbasia Canal has, therefore, been constructed as an earthen channel to carry 1,060 cusecs for Stage I in the portions which is to carry 2,200 cusecs after lining.

The lining will be taken in hand after the canal has grown silt berms and the brick kilns are ready. Each

year reaches which are ready for lining mainly on account of having grown proper berms will be taken up.

The masonry works of the main canal are designed for the final discharges.

The work of Stage I was started in December 1946, and in spite of post-partition difficulties the canal was opened in Kharif 1948, to provide irrigation to 20,000 acres. The work was continued and, in 1949, the area was increased to 100,000 acres.

A substantial portion of this area has been reserved for the refugees and has been allotted to them as well as to the local peasants. The refugees and the local peasants are busy developing their lands. A few thousand acres have been allotted to Mahsuds from the N.W.F.P. who have settled down here and are developing the land on good lines.

A compact block of 10,000 acres has been reserved for an Agricultural Research Farm and a Sugar-cane Fram for the proposed sugar factory at Khanpur. It is estimated that this farm will be able to grow under expert supervision enough sugar-cane to meet 50 per cent. of the Factory requirements. The rest of the cane will be obtained from private growers of the locality.

Stage II.

Stage II consists of lining of the 94 miles length of the Canal to have absorption losses and extend irrigation in another 150,000 acres. The work of lining is being started in 1950, and will be spread over four to five years.

An important feature of the Project is that out of 94 miles of the canal to be lined 67 miles can be closed down either wholly or in portions to carry out the lining work without obstructing irrigation because of existence of alternative routes for supply of water. The work of lining can, therefore, go on conveniently. The remaining 27 miles in the head-reach of the Abbasia Canal when shut down will obstruct irrigation of 60,000 acres of land. It is proposed to take up this reach last of all and rush through in one winter. It will not be difficult to do so after all the experience which the staff would have gained in lining work and its organization by having completed

the 67 miles. The cultivators who will lose one Rabi crop will find employment on the lining work.

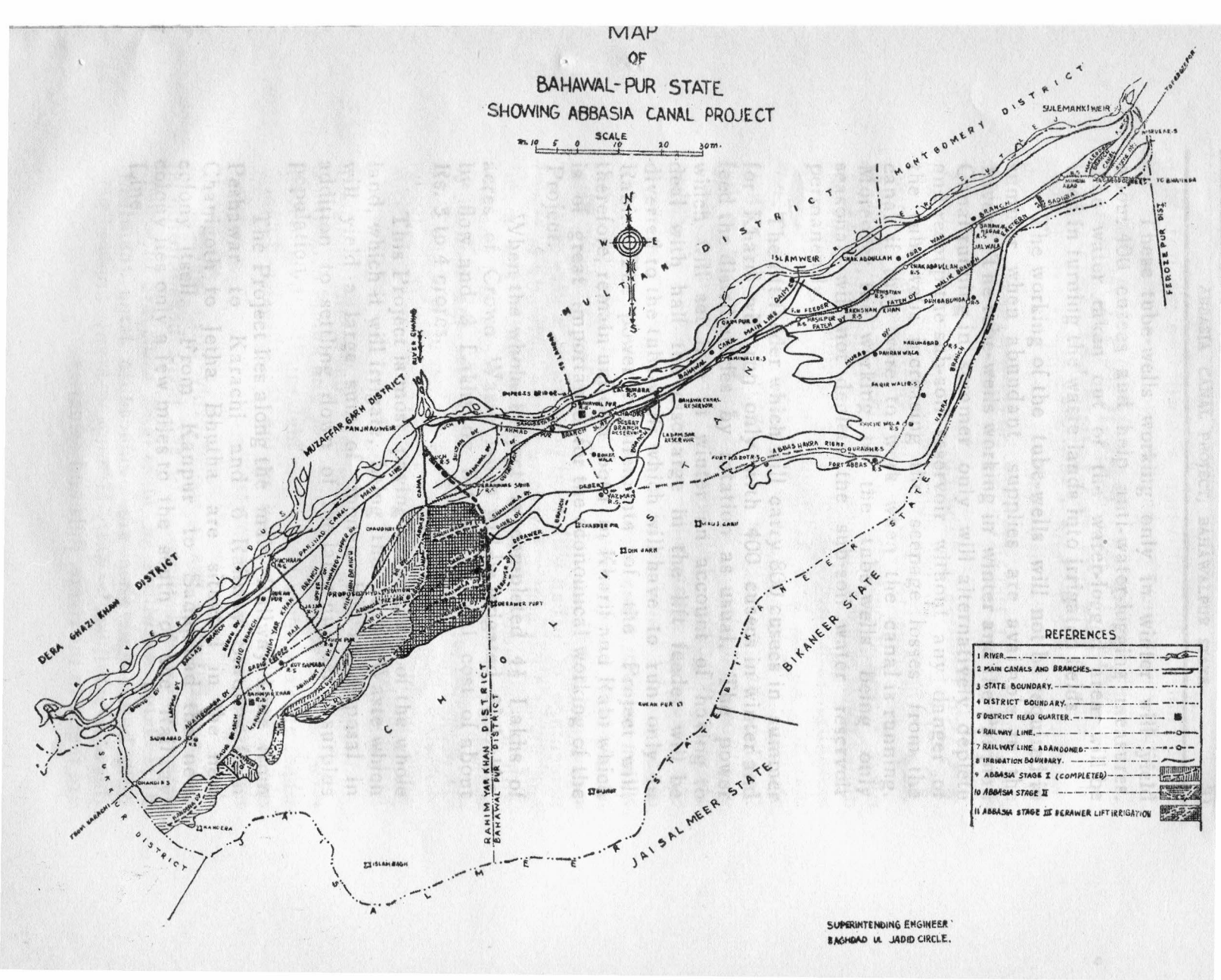
An important feature of the two stages is that the development of Crown Waste land has started without waiting for the completion of the lining and the Project will pay for itself by disposal of lands as the construction of lining proceeds.

Hydel Project.

On the completion of Stage II an 11' to 12' fall will be available at Mile 47 of the main canal where generation of hydro-electric power is proposed. The off-taking channels of the new system have been so arranged that almost a constant discharge can be maintained over this fall both in Kharif and Rabi. About 1,000 Kwt. generated at this site will be transmitted to the new Mandi town being constructed 10 miles away at Chaudhari Railway Station. This Railway Station is out of the six main line stations situated in the new Abbasia Colony and has been selected for a Mandi town on account of being centrally situated.

Derawar Lift Canal Scheme.

This can be called Stage III of this Project and after the completion of Stage II, providing flow irrigation to 2,50,000 acres Crown Waste land, another Project for lift irrigation of 2,00,000 acres is contemplated. A feeder lift Canal will take off at Mile 7 of the Abbasia Canal and by passing Uch, Dera Nawab Sahib will go up to Derawar and provide irrigation to the vast area of 2,00,000 acres which was originally proposed to be irrigated from the Bahawal Canal of Sutlej River. Due to shortage of water in this River this area was abandoned in 1933. Sutlej River supplies are absolutely inadequate for the existing irrigated tracts and any extension of irrigation is out of question especially after the partition. The only possibility of irrigating this abandoned area is to provide lift irrigation from Abbasia Canal. Local tube-wells in this area are not feasible on account of brackish sub-soil water. Abundant river supplies are available at Panjnad in Kharif and for Rabi it is proposed to provide water for this area from a series of tube-wells proposed in the water-logged area lying along the Head-reach of Panjnad Canal.



SUPERINTENDING ENGINEER
BAGHDAD UL JADID CIRCLE.

These tube-wells working only in winter will yield about 400 cusecs and help anti-water-logging measures. The water taken out of the water-logged area will be used in turning the waste lands into irrigated fields.

The working of the tube-wells will not be required in summer when abundant supplies are available in the River. The tube-wells working in winter and the Panjnad Canal running in summer only will alternatively deplete and recoup the sub-soil reservoir without any danger of the tube-wells increasing the seepage losses from the canal if they were to work when the canal is running. Moreover the working of the tube-wells being only seasonal, will not deplete the sub-soil water reservoir permanently.

The lift feeder which will carry 800 cusecs in summer for Kharif will run only with 400 cusecs in winter and feed the distributeries by rotation as usual. The power which will set free in winter on account of having to deal with half the discharge in the lift feeder will be diverted to the tube-wells which will have to run only in Rabi. The power requirements of the Project will, therefore, remain uniform both in Kharif and Rabi which is of great importance for the economical working of the Project.

When the whole Project is completed 4½ Lakhs of acres of Crown Waste lands will be irrigated, 2½ Lakhs, by flow and 2 Lakhs by lift, at a total cost of about Rs. 3 to 4 crores.

This Project is most paying on account of the whole land, which it will irrigate, being the Crown Waste which will yield a large sum of money by its disposal in addition to settling down of the large number of surplus population.

The Project lies along the main Railway Line from Peshawar to Karachi and 6 Railway Stations from Chanigoth to Jetha Bhutha are situated in the new colony itself. From Kanpur to Sadiqabad the new colony lies only a few miles to the south of the Railway Line.

NATURAL REGIONS OF EAST PAKISTAN

BY

ALI ARIF RIZAVI, DEPARTMENT OF GEOGRAPHY, LAHORE.

EAST Pakistan is drained by the mighty rivers Ganges (Padma), Brahmaputra (Jamuna), Meghna and their numerous tributaries and distributaries. These rivers spread deposits of fine silt in their neighbourhood during times of flood, thus renewing the fertility of the soils annually. On account of poor drainage conditions marshes, known here as 'bhils', 'jhils' or 'hoars', are abundant. They are, however, gradually silting up. The Province has an area of about 54,031 sqr. miles with a very large population which has been estimated to be about 46,000,000. This gives a density of more than 860 persons per square mile—one of the highest densities of the world. Densities of more than 1,500 are common within smaller areas of the districts. The population is mainly rural living in huts of bamboos and mud built on artificially raised mounds or high river banks. The percentage of urban with total population is very small—only about 5 per cent. Dacca was the only city in 1941, with a population of more than 300,000. The main occupation of the people is agriculture ; rice and jute are the principal crops. East Pakistan has the monopoly of world's jute producing—about 80 per cent. of the total world production and about 100 per cent of the world's best jute fibre.

Climatically East Pakistan falls under the monsoon type, with high rainfalls, and hot and humid conditions which are very oppressive. The high rainfalls have given rise to luxuriant vegetation in the Sundarbans, eastern hilly tracts, and in other parts.

East Pakistan has a considerably large number of cattle, goats and sheep. As the home consumption is little, large quantities of hides and skins are exported. Milk, butter and ghee are produced in large quantities through small scale dairy-farming. Many kinds of fish are found in the rivers, jhils and estuaries.

East Pakistan lacks minerals ; only a small amount of coal and some prospects of oil exist. The main power source, therefore, is the hydel power which is now being harnessed by the Government.

The rivers of East Pakistan control the human settlements, the activities of man, the construction and development of roads and railways and industries. River transport is very popular here. A net-work of roads and railways exist but they fall below the requirements. The following table gives the approximate mileage of roads and railways.

Roads.

Metalled	3,060 miles
Un-metalled	19,013 miles

Railways.

Broad Guage	518 miles
Metre Guage	1,036 miles
Narrow Guage	37 miles.

With the advent of Pakistan some new projects for the construction of new roads and railways have been considered.

East Pakistan is mainly an agricultural country ; only about 145 mills and factories exist which include rice husking mills, jute baling mills, sugar factories, glass and glass-ware factories, match manufacturing and cotton textile factories. Professor Nafis Ahmad has aptly remarked that the industrialization of East Pakistan is "not a task involving reconstruction but practically beginning from the very beginning"*.

Chittagong is the principal port of East Pakistan through which its import and export trade is carried on. The province exports jute, hides and skins, tea, oil seeds etc. Cotton textiles, drugs and medicines, grains and pulses are the chief items of imports. The total sea-borne trade of East Pakistan during 1948-49 amounted

* Prof. Nafis Ahmad, M.A.—"Some Planning Problems in East Bengal." Pakistan Geographical Review Vol. IV, No. 2, 1949.

to Rs. 520,000,000 with a balance of trade valued at Rs. 90,000,000 in favour.*

The main problem facing East Pakistan is of providing food to its teeming millions. Inspite of the fact that it produced more than 6,700,000 tons of rice in 1947-48, it had to import a large amount from West Pakistan and Burma. One of the solutions of this problem may be that the present emphasis on jute production in East Pakistan should continue. Cultivation of rice on irrigated lands in West Pakistan should be encouraged. West Pakistan should, thus provide the bulk of the requisite food supplies of East Pakistan. But this reliance in food on West Pakistan which is hundreds of miles away will not be workable during times of distress such as famines or war. Another solution which is always preferable to others is that of cultivating the land by scientific methods resulting in a marked increase in the total production. This, however, requires careful planning. A land utilization survey of the province is indeed an immediate necessity. More land should be brought under the plough such as the area of the Madhopur Jungle—the so-called "cultureable waste". A self-sufficient East Pakistan, at least in food, will be better and perhaps more powerful than at present.

NATURAL REGIONS

East Pakistan may be divided into the following natural regions based upon those of the "United Bengal" by Professor S. P. Chatterji** :—

(1) Eastern hills region
(2) Padma-Jamuna Doab
(3) Brahmaputra-Meghna Region
(4) Sylhet Valley Region
(5) Bagri Region or the Upper Padma Region
(6) Lower Padma Region
(7) Lower Padma-Meghna Region
(8) Sundarbans Region

Eastern Hills Region

East Pakistan is essentially a land of plains. The uplands cover only about 5 per cent of the total area of

*'Dawn' Karachi, May 19, 1949—Report issued by the Bureau of Commerical and Industrial Intelligence, East Pakistan, Dacca.

**Prof. S. P. Chatterji—"Place of Geography in National Planning," Indian Geographical Journal, Vol. XV, No. 1, 1940.

the Province. The eastern hills region comprises the hills of the districts of Sylhet, Tipperah, Noakhali, Chittagong and Chittagong Hills Tract. It forms part of a series of hills running from the Patkoi in the north towards the south along the eastern border of the Indo-Pakistan sub-continent. In the districts of Chittagong and Chittagong Hills Tract, the characteristic feature of these hills is the presence of a series of ridges and intervening valleys especially those of Karnafuli, Sangu and Matamuhari. These ridges run nearly parallel to one another and to the coast in a south-easterly direction. The highest peaks of this region are found in the Chittagong Hills Tract such as the Keokradang which is 4,034 feet in height.

The summers of this region are hot and winters mild. Average annual maximum temperature is 95°F and minimum 72°F. The normal annual rainfall is more than 100 inches. This heavy rainfall has resulted in a luxuriant vegetation growth on the hills. In the Chittagong Hills Tract varieties of forest trees are found together with bamboos, wild fruits, and medicinal plants. Trees of sal and other hard woods are abundant. Sagwan of the best quality is found here and the Jinnah Grove named after the late Quaid-e-Azam, covering an area of about 1,000 acres, is entirely of sagwan. Sagwan forests cover in all an area of 10,000 acres.

The main source of water power in this region is the Karnafuli river, which is now being exploited by the Government under the Karnafuli Multi-purpose project. A dam will be constructed across the river at the newly selected site at Childerdak, which is nine miles from Rangamati, the Headquarters of the Chittagong Hills Tract district. Work at the site has already begun and it is hoped that the project will be completed within five or six years. The Karnafuli during rains floods the neighbouring areas causing damage to crops. This project along with producing hydel-power will also ensure a regular supply of water in the river throughout the year and irrigate 70,000 acres of land.

The vast bamboo resources of the region offer possibilites for the manufacture of paper. A modern paper manufacturing factory will be established somewhere in the Chittagong Hills Tract. There are good opportunities of installing match factories as well.

In the Sylhet district this region is represented by its eight projections, the highest of which is more than 1,000 feet above sea level. Many of these hills have been cleared for the cultivation of tea ; where not cultivated they are covered with grass and forests. During the rains numerous torrents descend down these hills pouring water into the Sylhet valley to the north, turning its southern portion into a marshy tract. The forests of this part include trees like those of sagwan and sal.

The hills of this region are formed of sandstones and shales of Upper Tertiary times. Alluvial deposits of clayey loam either deposited by the rivers or dropped down from the hill-sides cover the valleys of the rivers, while on higher levels in the hills is found sandy loam.

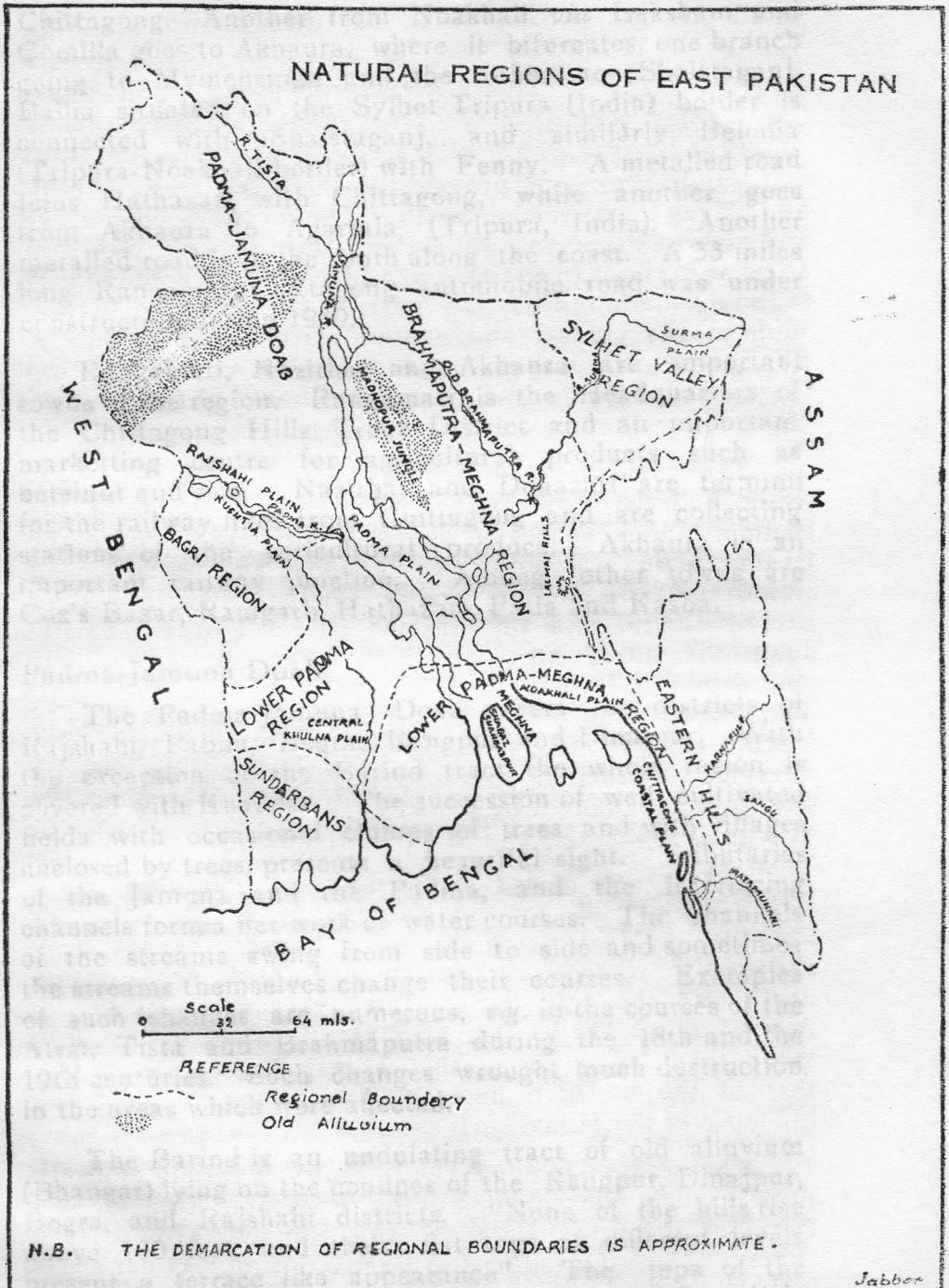
The main crops of this region are rice, sugar-cane, oilseeds, gram, pulses, and barley. Tobacco, cotton betelnut and tea are also grown. The fruits include *lichies*, bannana, papaya and orange. Some cattle, sheep and goats are reared.

Prospects of oil exist in the Chittagong Hills Tract, and the Sylhet districts, which comes under the Assam Oil bearing belt. A note by Dr. A. Karim, ex-Director of Industries, Govt. of United Bengal appeared in the Daily Pakistan Observer, Dacca, of 14th the September 1949, which stated that red oxide of iron is found in Chittagong and Chittagong Hills Tract and the Sylhet districts. It is found mixed with lumps of conglomerations of sands, pebbles, clays etc. hardened into stone. In his note Dr. Karim points out that if geological survey of these districts is carried out it may be possible to produce red oxide of iron in commercial quantities. Red oxide of iron is utilized for the manufacture of paints and enamels, coloured cement tiles, colour wash on buildings, etc. Various clays of commercial value are also reported to occur in this hilly region.

This region is very sparsely populated because of its hilly nature. Most of the people are tribesmen some of whom subsist on whatever they can get from the forests.*

Railway lines in this region are very few. Two metre gauge lines join Nazirhat and Dohazari with

*D. C. Das Gupta—"Naturvolkers of the Chittagong Hills Tract—Bengal", Calcutta Geographical Review, September 1940.



N.B. THE DEMARCATION OF REGIONAL BOUNDARIES IS APPROXIMATE.

Jabbar

Chittagong. Another from Noakhali *via* Laksham and Comilla goes to Akhaura, where it bifurcates, one branch going to Mymensingh and the other to Shaistaganj. Ballia situated on the Sylhet-Tripura (India) border is connected with Shaistaganj, and similarly Belonia (Tripura-Noakhali border) with Fenny. A metalled road joins Hathazari with Chittagong, while another goes from Akhaura to Agartala (Tripura, India). Another metalled road is in the south along the coast. A 33 miles long Rangamati-Chittagong automobile road was under construction during 1949.

Rangamati, Nazirhat and Akhaura are important towns of the region. Rangamati is the Headquarters of the Chittagong Hills Tract District and an important marketting centre for agricultural products such as betelnut and rice. Nazirhat and Dohazari are terminii for the railway lines from Chittagong and are collecting stations of the agricultural produce. Akhaura is an important railway junction. Among other towns are Cox's Bazar, Ramgarh, Hathazari, Patia and Kasba.

Padma-Jamuna Doab

The Padma-Jamuna Doab covers the districts of Rajshahi, Pabna, Bogra, Rangpur, and Dinajpur. With the exception of the Barind tract the whole region is covered with Khaddar. The succession of well cultivated fields with occasional clumps of trees and with villages enclosed by trees, presents a beautiful sight. Tributaries of the Jamuna and the Padma, and the interlacing channels form a net-work of water courses. The channels of the streams swing from side to side and sometimes the streams themselves change their courses. Examples of such changes are numerous, *e.g.* in the courses of the Atrai, Tista and Brahmaputra during the 18th and the 19th centuries. Such changes wrought much destruction in the areas which were affected.

The Barind is an undulating tract of old alluvium (Bhangar) lying on the confines of the Rangpur, Dinajpur, Bogra, and Rajshahi districts. "None of the hills rise above 100 feet, and their flat tops at different levels present a terrace like appearance". The tops of the hills are covered with a stiff reddish clay. The whole area is drier than the neighbouring alluvial flats. The

small streams (Kharis) have cut deeply into the hills. Winter rice is the only crop grown in this area.* Where not cultivated the hills are covered with low, thin scrub, interspersed by large trees. These are remnants of an extensive forest which flourished in the past.

Sandy loams are prevalent in the north-western part and clayey loams further south. The former is very fertile and yields two crops, while the latter does not yield two crops as it is not so fertile. Sandy loams are predominent in the northern and eastern parts of the Rangpur district, while in the central and southern parts a dark heavy, clayey soil 'Khiyar' is found. Fertile sandy soils are found in the islands and along the banks of the Jamuna. Hard clayey loams prevail in the Bogra plain.

The Rajshahi plain is a well drained and comparatively high tract of sandy soil along the bank of the Padma. Open spaces of rice and jute lands cover the Padma plain. Swampy depressions and water-logged area occupy the eastern part of Rajshahi, south-western part of Bogra, and the western part of Pabna. This is due to the silting up of the river beds resulting in the obstruction to drainage in the depressions between them. The Chalan Bhil is the biggest of these marshes lying in western Pabna and eastern Rajshahi. These Bhils form a serious obstruction to transport by land because roads and railways cannot be constructed across them except with great difficulties and at high expenses.

Hot season begins in March, and continues uptil June, while cold season remains from November to February. Mean temperature in January ranges from about 63°F in the south to about 61°F in the extreme north and the July temperatures vary from 89° to 83° Annual rainfall also increases from 56″ in the south to more than 90″ in the north. This is because of the fact that in the northern part the region comes under the influence of the Himalayas.

The Padma-Jamuna Doab grows a variety of crops. Rice is much concentrated in the Rajshahi, Rangpur and Dinajpur districts. Rajshahi and Rangpur grow a large amount of wheat produced in East Pakistan. Other crops include gram and pulses, barley, sugar-cane, oil-seeds, jute,

* Prof. S. P. Chatterji—Op. Cit.

tobacco, and betelnut. The region produced more than 2,100,000 bales of jute (of 400 lbs. each) during 1947-48. Rangpur is among the important jute producing districts of East Pakistan. Pabna is an important district for fresh water fish with about five fish-marketting centres. The number of goats, sheep and cattle is also fairly large in the region.

The main towns of the region are Rajshahi, Pabna, Bogra, Serajganj, Dinajpur and Rangpur. Among others are Saidpur, Ruhea, Parbatipur, Kaunia, Kurigram, Amnura, Nator and Santahar. Rajshahi, Bogra, Dinajpur, Rangpur, and Pabna are the Headquarters of the Districts of their respective names. Bogra is situated on the bank of the Karatoa river, with one part on its right, and the other on its left bank. At present ferry boats are the means of communication between the two parts, but now the construction of a bridge on the river is under the consideration of the Government.

This region has the largest mileage of railway lines in the whole of East Pakistan, with more than 200 miles of broad gauge line and about 240 miles of meter gauge. The main broad guage line runs from the northern extremity of the region to the southern. One of its branch lines runs from Abdulpur to Amnura *via* Rajshahi, while another goes to Serajganj. The broad guage line links up with that of the Bagri Region south of the Padma River and goes to Calcutta (India). The towns of Santahar, Nator, and Parbatipur are situated along this line. Bogra, Dinajpur, Rangpur, Saidpur, Ruhea, Kaunia and Kurigram are on the meter guage line. The town of Pabna is not served by any railway. Rivers, Jamuna and Meghna, divide East Pakistan into a western and an eastern zone having no direct connection with each other. However they are linked up by means of a meter guage ferry from Bahadurabad, to the east of Jamuna, to Tisto Mukh Ghat towards the west of the river. "Passangers are taken across either on a passenger carrying barge or on the passenger steamer. Wagons are pushed on to barges fitted with railway tracts. The barges are then towed across and the wagons are pushed up on to the Ghat tracts on the other bank. A single barge can accommodate 39 wagons. Nearly two hundred wagons are ferried across daily.*

*"Second year—Pakistan 1948-49", Pakistan Publications, Karachi.

Nearly all of the towns have road connections, though in some cases, they have no direct link, but *via* some other town which lengthens the journey.

Like the rest of East Pakistan, this region also is industrially backward. Only a few factories exist like the hosiery works in Pabna, "*desi*" sugar mills in the Rajshahi, and rice-husking mills in Dinajpur. The railway work-shop at Saidpur carry out meter guage work. Hence they are remodelled so as to carry the broad guage work also, which was formerly executed at Kanchrapara (West Bengal, India). A fair quantity of shellac is produced in Shibganj Thana of Rajshahi district, and the organization of lac industry on a co-operative basis is under consideration.

Brahmaputra-Meghna Region

The Brahmaputra-Meghna region covers the districts of Dacca and Mymensingh, and most of the Tipperah district. The Madhopur Jungle and the isolated Lalmai Hills are the only tracts of old alluvium, otherwise all the region is covered with new alluvium. The Madhopur Jungle, about 40 feet above sea level, consists of terraces, occupying a considerable area of the Dacca and Mymensingh districts. The soil in the valleys of the numerous rivulets, which have dissected this tract, is clayey loam yielding good crops, while the hills are covered with a hard, reddish clay which is infertile, and, when dry, is as hard as stone. "This formation is of considerable depth and offers much resistence to erosive action of the rivers and when the Brahmaputra towards the end of the 18th century had raised its eastern channel and was compelled to find another outlet, it was the stiff clay of the Madhopur Jungle which forced it to break westwards."* Forests occupy the uplands. Professor S. P. Chatterji has suggested that this undeveloped and neglected tract may yield good crops if suitable manures are applied to it.

The Lalmai hills, a few miles west of Comilla town, is another outcrop of old alluvium. These hills rise to a height of 100 feet and are covered with forests of trees and brush-wood.

The tributaries of Meghna and Jamuna water this region. The Surma joins the Padma-Jamuna system

*Imperial Gazetteers of India (Provincial Series) Eastern Bengal and Assam, 1909.

near Bhairab Bazar falling into the old bed of the Brahmaputra. The large volume of water carried by these rivers can be utilised in developing the existing fisheries. The Directorate of Fisheries, Government of East Pakistan, is considering the possible expansion of fisheries in this as well as other parts of East Pakistan.

The northern portion of the Mymensingh district along the Susang Hills, a continuation of the Garo Hills to the north, is occupied by marshes. Similarly towards the east of the old Brahmaputra, all along the Mymensingh-Sylhet boundary, marshes are abundant. To the west of the river, the general level of the ground is comparatively higher containing a large part of the Madhopur Jungle. The Mymensingh plain is level and open, with well cultivated fields dotted with villages.

The Dacca and Tipperah districts are level alluvial plains broken only by the Madhopur Jungle and the Lalmai Hills respectively. The Lalmai Hills belong to Upper Tertiary formations. A soft clayey soil is found in the marshes on the Dacca-Sylhet border, as well as on the Mymensingh-Sylhet border.

The soil of the Meghna plain is very fertile and possesses the quality of retaining moisture. The loamy soils of the southern Padma plain are also fertile, but the sandy loam prevailing in the northern part does not retain moisture to the same extent as the former. The Mymensingh plain is occupied by a hard clayey loam (Entel) which in some places is as hard as that of the Madhopur Jungle.

" The temperature in summer months is considerably lowered by moisture-bearing winds from the Bay of Bengal. The mean temperature in January range from 66°F in the south to 65°F in the north." Mean July temperatures vary between 83°F to 82°F. " The whether is very pleasant in the cold season from November to February. The normal annual rainfall also increases from the south (74") to the north (89")."*

This region is the ideal home of jute and sugar-cane. Mymensingh district alone produces about 25 per cent of the total jute production of East Pakistan. The

* Prof. S. P. Chatterji—Op. Cit.

total jute produced in this region during 1947-48 amounted to about 3,180,000 bales. Other important crops are rice, oil-seeds, and betelnut. Cattle, sheep and goats are reared in large numbers in the Dacca and Mymensingh districts. Much of the hides and skins produced are exported. Fresh water fish are in abundance.

Lignite coal has been discovered in the Mymensingh district in a fairly larger area, and it is expected that it will be quite useful for house-hold consumption and for stationary boilars in industries. Hamaetitic deposits of iron have been reported to occur in the Dacca district.

Tropical deciduous trees such as sal and other hard-wood are found in the Madhopur Jungle. Fuel-wood for local consumption is also obtained from these forests.

The Brahmaputra-Meghna region is one of the most densely peopled areas of the world; the density of population in Mymensingh being more than 1,000 and that in Dacca 1,542. In some Thanas of these districts the density is much higher, for example in the Lohaganj Thana of the Dacca district it rises to 3,228 persons per square mile.

Important cities and towns of this region are Dacca, Mymensingh, Narayanganj and Comilla. Dacca was the only city of East Pakistan which had a population of more than 300,000 in 1941. It is situated on the river Buri Ganga. It has been an important centre of trade and industry for centuries. The Dacca muslin was once famous throughout the world. Dacca was the capital of Bengal in the Moghal times, but with the decline of the Moghal Empire it lost much of its glory. At present it is the capital of East Pakistan and the seat of a University. The damp climate of this region is suitable for the production of cotton cloth. Besides this it is a market for jute with many factories for match manufacture, boat building and factories for the production of glass and glass-ware, and other articles. It is the biggest aviation centre of East Pakistan with the aerodrome situated at Tijagaon, five miles from the city.

Narayanganj is another town of importance, ten miles from Dacca, with which it is connected by

automobile road and railway. Various kinds of factories are situated here. It is the largest jute exporting town in East Pakistan and an important centre of business.

Textile, glass, match manufacturing, jute baling, and pressing, and sugar factories are found in other parts of Dacca and Mymensingh districts. Many jute pressing mills are located in the Tipperah district also.

Among other towns of this region are Jharia-Jhanjail, Mohanganj, Tangi, Bhairab Bazar, Gouripur, Bahadurabad, Chandpur, Laksham and Jamalpur. All these towns are connected by meter guage railway and roads. A meter guage ferry exists at Bahadurabad linking the region east of Majuma with that to west. River steamers are a popular form of transport specially in the Meghna, Jamuna and Padma rivers.

A new railway line from Dacca to Aricha will minimise the 12 hours journey from Dacca to Goalundo, to the west of Padma by about 7 hours. Two new roads from Mymensingh to Tangail and to Halughat will have a length of 50 miles and 20 miles respectively. Passenger ferry services were started in February, 1949, between Jagan Nath Ghat and Serijganj Ghat, and the E. B. R. has started a goods ferry services also between them from December 15, 1949.

Sylhet Valley Region

The Sylhet Valley Region covers most of the Sylhet district. The region has in fact all the physical aspects of the Padma-Jamuna Delta except the presence of distributaries. Towards the north of this region the Khasi Hills rise abruptly from the level plain, while in the south are the projections of the eastern Hills region.

The general aspect of the region is a uniformly level plain broken only by the 'tilas', or small hillocks, which are met here and there in clusters. These tilas are formed of sand, clay and gravel, 'highly indurated by a ferruginous cement.' The Khasi and Jaintia Hills form cliffs west of Therriaghat dropping 4,000 feet or more from the Shillong Plateau. These hills are like an unbroken wall from east to west. The area is covered with alluvial deposits of clay and sand, excepting the " tilas ",

The river system of this region consists of the Surma and its tributaries which intersect it in all directions. These rivers, like other rivers of East Pakistan have raised their banks by deposition of sediment above the level of the surrounding country, thus forming depressions between themselves. As soon as the monsoon sets in, the depressed tracts between the high banks of the rivers get covered with waters of the flooding rivers as well as the water pourd into the valley by the torrents which desced down the surrounding hills. In consequence, much of the region is made a sea of water, especially in the northern, western and southern parts, where the marshes are abundant. These marshes are low lying basins filled up with water during the rains but dry up during the cold season 'except in the very centre of the basin'. At that time these dried up tracts provide excellent pastures and good lands for the cultivation of early rice. Reeds and grasses cover these marshes. These swampy basins are, however, silting up, thus reducing the area of the submerged land to a considerable extent. As considerable area gets submerged during the rains, habitations are confined to the high river banks and to the artificially raised mounds.

The eastern part of the region, the Surma plain around Sylhet, is comparatively higher and is a vast alluvial plain, "covered with rice fields and dotted over with hamlets embowed in groves of fruit trees and bamboos."* The region comes under the seismic belt of the Indo-Pakistan sub-continent. The earth-quake shocks of June 12, 1897, wrought much havoc. Casualties numbered 545, a large number of them being due to drowning.

The climate is warm and humid, but fairly cool and pleasant between the middle of November and the middle of February which is the cold season. Temperature begins to rise in March but heavy rains in April and May prevent the development of fierce hot weather. The annual rainfall of the region increases from 94" in the west to 157" in the north-east.

Among the food crops grown in the Sylhet Valley region are rice, sugar-cane, oilseeds, and potatoes, while

*Imperial Gazetteers of India (Provincial Series) Eastern Bengal and Assam 1909.

jute, betelnut and tea are commercial crops. Sylhet district produces a large amount of the total tea produced in East Pakistan. Orange is the main fruit of this area. It is also one of the main producers of hides and skins.

The main town of this region are Sylhet, Habiganj, Shaistaganj, Mauluvi Bazar, Kulaura and Latu. Sylhet is the headquarters of the district. It is a big business centre dealing in the agricultural products of the region. It is connected with all the important towns of this region either by roads or by railways. Kulaura is also an important railway junction. Here the railway line from Akhaura, *via* Shaistaganj, is bifurcated, one branch going to Sylhet and the other to Latu, and thence to Lumding in Assam (India). From Shaistaganj a branch goes to Balla, on the Sylhet-Tripura (India) border. Habiganj and Mauluvi Bazar are assembling markets for betelnut and other agricultural commodities. Both of them have road connections with other towns of this region but no railway connections. Before the World War II Habiganj was linked with Shaistaganj by a railway line, which was dismentaled during the war. Now the Government is considering to revive this railway line and to open a new railway between Sylhet and Chatak, the latter being given a priority.

Brown coal has been discovered near Habiganj while the presence of oil on the eastern border of the district which lies in the Assam Oil bearing belt is expected. Cotton and silk cloth, boats, toys, shell bracelets, mats, cane furniture, ghee, and molasses are produced here.

Bagri Region

This region covers the districts of Kushtia and a large part of Jessore. It comprises of large alluvial plains and marshy tracts with 'dead and dying' rivers. Here is the old delta of the rivers Padma and Jamuna. The chief rivers are Matabhanga and Bhairab, which afforded the regular means of transport and communications before the opening of railways. But navigation has now become difficult, except during the rains, due to the silting up of their connections with the Padma.

In the Jessore plain the country is generally well cleared of trees. In Kushtia villages and clusters of trees

dot the plain. Rice grows in abundance but where the marshes do not dry up throughout the year there is no sign of cultivation. However, most of these marshes are gradually being silted up and many of them have been reclaimed and brought under cultivation.

Sandy loams predominate. These soils are fertile but the low yield of rice and other crops in this region shows that the lack of other growth premoting forces has marred the productivity.

The normal annual rainfull of the upper Padma region is more than 55° and the mean temperature for January 50° F which rises to 55° F in April. The main crops are rice and sugarcane, gram and pulses, oil-seeds, tobacco and jute. Papaya in Jessore and pine-apple in Kushtia are among the fruits grown. Coconut is grown in large amounts in Jessore.

Kushtia and Jessore are the chief towns of this region and headquarters of the districts of their respective names. They are collecting centres for the local products. Kalukhali, Kumarkhali, Bajbari, Bhairamara and Darsana are other towns. The region has only the broad guage railway line. The main line joins all these towns except Jessore which is situated on the isolated Jessore-Khulna section of the East Bengal Railway. It has been proposed that this section may be linked up with the rest of E.B.R. by connecting Jessore and Darsana, a station on the line from Bhairamara to Calcutta. The main line to Calcutta is connected with that of the Padma-Jamuna Doab by means of the Hardinge Bridge on the Padma River.

Lower Padma Region

The Lower Padma region includes parts of Khulna, Jessore, Bakarganj and Faridpur districts. Silted up river channels and swamps characterize the region. The country is generally flat but the surface is very slightly raised above the flood level. Groves of betelnut are abundant in the central Khulna plain which, though low-lying, has habitation and cultivation. Marshes are gradually reclaimed and brought under cultivation. In the southern part, where this region merges with the Sundarbans, and where the land has been cleared, rice is grown. Most

of the people live far apart among the rice fields and not collectively in the villages. "Sluggish creeks 'Khals' and rivers wind about among the rice clearings, and their course can be traced only by the fringe of brush wood that lines their banks."*

The salinity of most of the rivers caused by the silting up of their connections with the Padma is responsible for the problem of drinking water, especially in the Khulna district, and as the sweet water is one of the dire necessities of man the region is comparatively thinly populated. Difficulty of finding suitable sites for habitations is another cause of the low population.

The typical soil of this region is clayey loam though loamy soil is found on the banks of the rivers. Peaty soil ('tobe') is met within the marshes. The normal annual rainfall of this area (74") is very low in comparison with the neighbouring Lower Padma-Meghna Region. Mean temperature ranges from about 65° F in January to about 84° F in May.

Rice, sugar-cane, betelnut, coconut, jute, and tobacco are among the crops of this region, while banana, mangoes, melon and water-melon are some of the fruits. Faridpur district is one of the important jute producing areas of East Pakistan. Drying and salting of fish is an important industry of the region.

Khulna, Bagherhat, Madaripur, Faridpur, Goalundo Ghat and Bhatiapara are among the towns of this region. Khulna, Faridpur and Bagherhat are assembling markets for tobacco and betelnut, as well as for other commodities like coconut. Khulna and Faridpur are district headquarters. Bagherhat is connected with Khulna by a narrow guage line about 37 miles in length. Khulna is situated on the isolated Khulna-Jessore section of E.B.R. which goes to Calcutta *via* Jessore. Bhatiapara, Faridpur and Goalundo Ghat are terminii for the railway lines from Kushtia *via* Kalukhali. Communication problem of the western part of this region with rest of East Pakistan is very acute. Steamer service from Dacca to Khulna *via* Barisal is a tedious one and takes 48 hours, while that *via* Goalundo takes 36 hours. All the

*Bengal District Gazetteers Vol. XV, 1908.

important towns are connected with each other by roads, but most of them are flooded during rains, and boats are then the only means of communications even between one house and another in some parts.

Lower Padma-Meghna Region

This region occupies most of the area of Bakarganj, Noakhali and Chittagong districts, The Bakarganj district is formed partly of mainland and partly of islands of the Meghna Estuary, the biggest being Shahbazpur. It forms an unbroken plain, with a network of streams. In the Nort-West is a marshy tract—continuation of the bhils of Faridpur district. Sandy loams cover the Shahbazpur island.

The Noakhali plain has a dip towards the centre, between the high banks of the Meghna and the hills of the north-east. The surface is covered with recent alluvial deposits of clayey loam. The islands, such as Sandwip and Hatia, are included within this region.

In the Chittagong Coastal Plain is found a type of soil which is locally known as "Mahina". It is a heavy clayey soil impregnated with salt. The soil becomes fertile sandy loam away from the coast.

In the western portion of the region "a perplexing multiplicity of names extends even to the smaller water courses, which are often known by different names to villagers living on opposite banks, while the Meghna Estuary itself is known in different parts of its course as the Satabaria, the Ilsa, the Tetulia or Telta, and Shahbazpur."* The rivers are tidal and most of them navigable throughout the year. During the rains when an immense volume of the rain water pouring down the rivers flows sea-wards, the tidal action becomes powerless. The Matamuhari River in the extreme southern part of this region forms a delta. In this deltaic tract the surface is covered with tidal forests of mangroves, though cultivation is also carried on in some portions.

Deposition as well as erosion is always taking place. Many of the islands of the Meghna Estuary which are still in the process of building are repidly reclaimed for

*Imperial Gazetteers of India (Provincial Series) Eastern Bengal and Assam, 1909.

the cultivation of rice and betel palm. Most of the Chittagong Coastal Plain and the low lying islands of the Matamuhari delta have embankments for the protection of crops from the saline sea water.

The Lower Padma-Meghna region receives a copious annual rainfall of 114". The mean temperature of May is about 82° F while that of January 62° F.

In this region the production of rice, gram and pulses decreases from west to east *i.e.* from Bakarganj to the Chittagong district. Sugar-cane is grown in large quantities in the Bakarganj and Chittagong districts, while jute, betelnut and coconut are more abundant in Bakarganj and Noakhali. Bannana is the widely grown fruit. Shark fish is found along the entire coast of Chittagong especially of the Maiskhal island and Cox's Bazar. Shark liver oil is extracted from them in a fairly large quantity. Coconut is so abundantly grown that the vegetable ghee industry can easily be established.

Chief towns of this region are Barisal, Noakhali and Chittagong. Barisal is the headquarters of Bakarganj district, and a great marketting town for rice and betelnut. It is connected with other towns of East Pakistan by road and steamer ways. It is an important assembling station for coconut, hides and skins, bamboos, fish and wood from Sundarbans. Fine ' Sarees ', cloth and combs are produced here. Noakhali is a marketting as well as assembling town for the agricultural produce of the Noakhali district of which it is the headquarters. Chittagong is the only modern port of Pakistan. It is situated on the Karnafuli river about 12 miles from the sea and contains about 60,000 souls. It is a natural harbour and was an important port before the British developed Calcutta. Its importance in the past can be realized from the fact that the Portugues named it the 'Porte Grande'. But under the British rule it remained neglected and lost its importance. Now the East Pakistan Government is considering proposals and schemes for its development. At present the port has five berths, and it is hoped that this number will be increased to 13. Construction of jetties and ramps has already started, and two lighterage jetties and four ramps have been built and brought into use. Prior to partition the capacity of the port was about 5 lakh tons a year. It has now increased to about

120,000 tons per month and is further increasing. Chief imports of the port are salt, mineral oil, machinery, coal, railway oil, cottan textile, and drugs and medicine, while jute, wax, tea, hides and skins, eggs, poultry and livestocks are the chief exports. The total exports during 1948-49 valued at Rs. 30·9 crores and imports at Rs. 2·13 crores. Jute accounted for about 80 percent of the export. These statistics when compared with those for pre-partition days (for example with those for 1938-39 when the imports and exports combined amounted to Rs. 1,260,000) show that Chittagong will soon become one of the premier ports of Indo-Pakistan.

Bakarganj, Patuakhali, Fenny, Jalkhati, Sitakhund and Sonagazi are among other towns of this region. All of them are connected with one another by rail or road or steamer ways. A meter guage railway links Chittagong with the "jute centre" of East Pakistan, as well as with Sylhet.

Red oxide of iron is found in and around Chittagong and near Fenny. Rice-husking mills are situated in the Bakarganj district while a modern leather factory exists at Raipur (Noakhali districts). The railway workshops at Chittagong which were completely stripped off during the war, have been rebuilt by E. B. R. and are now utilized for the repair of meter guage rolling stock.

Sundarbans Region

The Sundarbans region is a " region of morasses and swampy islands most of which are clothed with a dense evergreen forest, while some are covered with water at flood tide".* It occupies a large part of Khulna, and the south-western portion of Bakarganj. It is very sparsely populated because of being covered with tidal forests, which resemble those of the equatorial region in their dense and rapid growth. In fact the coastal regions and the island fringing the coast are practically uninhabited. A maze of water courses has been formed as the branches connecting the various stream are themselves connected by numerous smaller channels and creeks. Between them lie enclosed islands of various shapes and size. The land building activity of the rivers is still going on, though slowly. The mouths of many of the estuaries

* Bengal District Gazetteer (Vol. 15).

are obstructed by sand bars which stand in the way of navigation. As the rivers are saline the problem of getting fresh drinking water is very acute.

The soil of the Sundarbans (heavy clayey soil impregnated with salt) is very fertile, so much so that it has added one more to the many problems of the region. The untamed fertility is a source of trouble. The reclaimed tracts are again covered by forests of reeds etc. if the encroaching natural vegetation is not checked every year.*

The mean temperatures in the Sundarbans region vary from 66°F in January to 84°F in April. The annual rainfall is about 74".

Forests cover an area of about 2,316 sq. miles in this region, and are known as the "Sundarbans". These are evergreen tidal forests of trees and shrubs with mostly those species which are accustomed to saline conditions. Undergrowth is enormous ; some plants send aerial roots from their subterranean roots, and sometimes these become so numerous that passage through them becomes difficult. These are species of mangrove trees. Among the palms of the Sundarbans two are worth notice : one of them occupies only those parts which have saline conditions while the other thrives only in drier parts. It is curious that while the grasses are abundant no species of bamboo are found.

The Sunderbans are a valuable source of mangrove for fuel and "sundri" for ship-building and house-building purposes. Sundri trees are found in abundance but are not properly cared for. Simal wood is also found which can be used for the manufacture of matches. Ply-wood can also be obtained. Another useful tree, found in the Sundarbans, is the 'Goran' tree. Its bark produces an excellent tanning material, and was extensively used in the Calcutta tanneries. The wood is excellent for fuel. Honey is produced in large quantities.

CLIMATE OF THE PAK PUNJAB

BY

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THE Pak Punjab, the land of five rivers, forms a composite unit, though with some reservations, of the flood plains of the five rivers whose permanent water supply makes them particularly attractive for human settlements and a characteristic site for an increasing and dense agricultural population. This is a region of Doabs where the climate is one of prolonged drought imposing on its inhabitants an urgent need for irrigation for which the five rivers, from which the region has derived its name, promise abundant means.

The region is included in the monsoon lands of Indo-Pakistan sub-continent because of political complications as well as because it happens to share a small amount of rainfall from the more curious and intrusive weaker tropical cyclones forming at the head of the Bay of Bengal and travelling up the Gangetic Valley in a north-westerly direction. In fact it is on the fringe of the sub-tropical desert stretching in the west in the Great Sahara, across to Arabia and then onward to the "Thar" the Great Indian Desert. It would be better to call it a semi-arid region surrounding the Thar Desert on the north. Compared with the typical monsoon climate it receives not only less rainfall in the wet season but also differs in its temperatures, pressures annual temperature ranges and more particularly in the natural vegetation. It presents a contrast to monsoon-lands in its precipitation in winter not from the North-east Monsoons but from the shallow Atlanto-Mediterranean depressions from the west. General prosperity and welfare of the people and entire economic structure of the countries in monsoon-lands is based on the timely and anxiously awaited rainfall from the moisture laden monsoons while in the Pak Punjab dependability on rainfall is not only less but decreases with its decreasing amount. Here the rivers are of primary importance. They are fed from the snow-clad mountains and are a continuous source of water supply throughout the year. The region is far into the interior where continental influence is at a maximum and sea

influence at a minimum. The climatic stamp indelibly impressed on its soils and soil-tillers is totally different from that in monsoon-lands. Here in the Pak Punjab the people are as hard as the crops which they grow. Millet and Wheat of the Pak Punjab are definitely contrasted to Jute and Rice of the monsoon-lands. There is decidedly some difference between marine conditions and continental conditions, between more rain and less range of temperature and less rain and more range.

The essential feature of the Pak Punjab climate is that evaporation exceeds precipitation. In other words during a normal year more water could be evaporated than actually falls as precipitation. Rainfall variability is so great that there are wide fluctuations from year to year. A succession of years with good rainfall may be followed by a couple of drought years with consequent crop failures and ensuing economic catastrophe and disaster. Averaging roughly total annual precipitation does not exceed 22". As a result of this rainfall deficiency there is no surplus of water to maintain a constant ground water supply. Climatic conditions are such that, but for the presence of the five rivers which flow through this region, the Pak Punjab, which is now so famous for its agricultural produce, would have been a barren and a desolate component of the "Thar" desert.

Because of its characteristic interior location the temperatures tend to be very severe for their latitudes, having relatively extreme seasonal temperature and consequently large annual ranges. The region is far from the seas which are the principal source of atmospheric water vapour. As the region is practically south of latitude 34° N. the sun power, in summer, is great, especially under the cloudless skies until the month of July when the monsoons make themselves felt. It is a low lying plain and summer temperatures are very high, with a distinct decrease in the total amount and in the relative value of precipitation. During this period of high sun heat tends to develop a low over this area. This centre generates inflowing winds of general monsosn character. Even though this low is the goal of the landward moving sea winds in summer still this is not a region of heavy precipitation. This is due to the great distances these winds have to cover enroute here. Much of the moisture is lost on the way. The winds absorb heat on

their travel over the heated surface and its humidity is decreased. Again the long trajectory of the winds over the heated ground produces an air temperature comparable to the land surface temperature; hence the small amount of precipitation. Prior to monsoons the amount of sunshine is great and cloudiness small. The days are very trying. The direct as well as the reflected sun-light from the light coloured soil (a characteristic feature of the relatively humus-less soils of Pak Punjab) is blinding in its intensity. The rapid day-time heating of the lower air over the sun-baked surface leads to convectional overturnings; this interchange of lower and upper air tends to accelerate horizontal surface currents during warm hours when convection is at its maximum. These horizontal winds raise up fine dust causing dust storms As there is no moisture to bind the soil the dust storms. are very dark and cause considerable inconvenience to human-beings. These horizontal winds have a strong reaction in the eastern parts of the Gangetic valley and prepare the ground for drawing in cyclones associated with the monsoons.

Although the temperature conditions and convectional overturnings are favourable for the formation of thunderstorms of fair weather type the lack of moisture and absence of any large water body to supply the requisite amount of water vapour (so important to supply the necessary energy to maintain the thunderstorms) does not encourage their development. However some weaker tropical lows do invade this area. Since these cyclones always retain a connection with their source region over the head of the Bay of Bengal, as they move westward, they are constantly fed with fresh supplies of moisture and thereby retain their rain bearing ch aracter for great distances. Weather conditions undergo rapid changes as soon as the monsoons introduce themselves in. Humidity increases as well as the sensibility of temperature. It is interesting to note that during this rainy season though the humidity is great and the skies overcast yet the rains may fail altogether. This is probably due to the following causes.

(*a*) The cyclones invading this region are not well developed.

(*b*) By the time the monsoons reach the Pak Punjab they are robbed of their moisture on their way here.

(*c*) The encircling highlands on the north and north-west act as a gigantic barrier against which the winds from east are pushed and rendered hot and dry. They fail to get an outlet to the west.

(*d*) The rising air currents perhaps do not reach the condensation level or if they do reach any precipitation is immediately swallowed up by the relatively more drier up-surging air currents.

(*e*) The Arabian monsoon current which has travelled a long distance over the barren and draught stricken area meets the Bengal Monsoon current over Punjab and appropriates a significant amount of moisture thus decreasing the probability of rainfall.

The failure of monsoons in the Pak Punjab has a very serious effect on the economic welfare of the region where more than 70 per cent. of the population pursues agriculture. But it is of prime importance to note that here in the Pak Punjab, like in many other regions in Western Pakistan especially in the Canal Colonies of the Pak Punjab, rainfall supplements the water supply from the irrigation canals. However this failure of monsoons effects the Pak Punjab agriculture indirectly by reducing the amounts of water in the source regions of the five rivers on which depends their water supply througout the year.

In winter the temperature conditions are exactly the opposite of those in summer. The winters are as cold as the summers are hot. Both the high pressure and low temperatures imply a minimum of water vapour and very rapid radiation and clear skies. The region has much the lowest temperatures in winter with some frost quite common. The minimum temperatures are generally associated with the north-west winds at the tail of a passing shallow cyclone from the west. Rawalpindi, Multan, and Lahore (when summer and winter temperatures are taken into account) all have a range of 40° F.

During winter this region as well as the adjoining areas act as a source region of continental like air masses which are usually stable and relatively non-cyclonic in character.

From this relatively high pressure winds gravitate in two directions—down the Indus Valley as North-east winds and down the Gangetic Valley as North-west winds. The former reinforces at once the north-east Trades over the Arabian Sea ; and the North-west winds, as soon as they are free from the relief control of Himalayas and the Deccan Scarp swing round to North and then North-east and reinforce the North-East Trades over the Bay of Bengal.

The important meteorological feature of the Pak Punjab is its winter rains from the shallow cyclones from the west. These winter rains are as effective as the summer ones. They not only supplement the irrigation water in canal colonies but also make possible growing of crops in large areas dependent on rainfall.

The shallow cyclones, technically called the western disturbances in Indo Pakistan, are in fact the Atlanto-Mediterranean depressions. They originate in the Mediterranean and move eastward in a procession, one following the other. It appears that they have an instinct to move east-south-east. In winter a cold anti-cyclone develops over Central Asia. The outer fringes of this High act as a more or less impenetrable barrier which the western disturbances cannot surmount or penetrate. These disturbances in their attempt to try a different path to move east, are thus controlled to a remarkable extent, and are guided or shouldered off to east by this High. This eastward movement of the depressions is again checked in the north-west of Pakistan and Afghanistan by a tongue of the same High which protrudes southward. This tongue of high pressure is associated with winds which are cold and stone dry. They are responsible for arresting further eastward movement of the disturbances. It is only when the Siberian High with its long tongue temporarily recedes northward that the disturbances are allowed to continue moving further east. After the disturbances are allowed to pass this military post its goal appears to be that long wedge of calm in the lee of the Satpura mountains which is formed by the Gangetic Valley and the Indus Valley.

In Central Asia conditions in winter are especially favourable for the development of cold anti-cyclones and equator-ward movement of the cold air into the regions that

normally are relatively warm. These out blowing winds are cold and effect areas of considerable extent. N.W.F.P., Pak Punjab, Baluchistan, and even Sind may experience their effects and may remain under the cold spell for days and weeks.

The cold air streams may be either due to considerable pressure gradients which accompany the winter disturbances or due to mere overflows of air from the anti-cyclone through the mountain passes. These are usually attended by a slight to considerable rise in atmospheric pressure and a corresponding fall in temperature and relative humidity. It is often preceded by showery conditions and are sometimes accompanied by rain, though essentially they are associated with clearing of fair weather conditions.

Conditions favourable for these cold air streams experienced in the Pak Punjab are an extensive and intensive winter High in Central Asia spreading south-west ward from North-west and Afghanistan with a low pressure over Sind and the Arabian Sea. Between the centres of these two pressure areas, cold, stiff north to north-west winds, with repidly falling temperatures may sweep over the Pak Punjab plains. If the pressure gradient is steep higher velocities may be achieved by these winds. Proceeding these winds there may be a slight decrease in pressure particularly if a wastern-disturbance is crossing the Pak Punjab plains.

Occasionally when these winds tumble down from the mountain slopes with terrific speed they raise up endless clouds of dust. The dust particles are carried over long distances and are so fine that sometimes they are mistaken for fog.

These climatic conditions, as they are, have a very strong influence on the soils and vegetation of the Pak-Punjab plains. Meagre and erratic precipitation in this area, together with a high evaporation rate and an associated low supply of ground water has resulted in relatively scant vegetation cover. But inspite of its scantiness, grazing of the domesticated and semi-domesticated livestock upon the sparse vegetation was the characteristic land utilization until the canal colonies sprang up and cultivation of the land assumed a general aspect. In areas beyond the reach of canal waters there are found bushes and plants which adapt themselves to

the arid conditions. They store water in their stems and are so physically equipped by nature that they can effectively endure drought. Scattered small thorny trees or bushes are in places interspersed with shallow-rooted grasses. Much of the land has been brought under cultivation with the help of gigantic irrigation schemes. These irrigated canal colonies constitute one of the most extensive and finest of the earth's agricultural lands. In addition to these areas already under crop production, much of the rest of the area is equipped with soils which in chemical and physical properties are highly productive. Yet because of the low and undependable rainfall and lack of extension of irrigation canals this is not extensively used for crops.

Fertility of the soils is closely associated with the flooding of the rivers. From time immemorial this region has depended for its fertility on the floods. As the rivers rose in the rainy seasons, they surmounted or breached their banks letting loose a great volume of muddy water which spread all around submerging the lands and giving them a coating of new fertile soil. These innumerable floods, disasterous though they may be, have proved to be of incalculable value in increasing the fertility of the soils. These soils have remained fertile due to dry climatic conditions. Although the soils lack humus the absence of heavy rains have left them un-leached and rich in valuable mineral salts so important for plant growth.

The most complete agricultural development in the Pak Punjab is taking place where irrigation water has been carried. The importance of the rich soils and good crops is evident from the regular extension of cultivated fields and the surplus of foodgrains that are avialable every year in increasing amounts. In certain parts the soil is so finely grained as to become somewhat heavy when irrigated except in more arid parts where sandy soils are wide spread. In certain areas poor drainage renders the lands unsuited for cultivation while on the other hand there are wide tracts which have been rendered improductive by alkalinity. However, generally speaking cultivation is rapidly eliminating such arid lands where water supply is increased from canals.

Residual soil is found on the hills. These hills are stony and barren to the view but support a characteristic vegetation and afford grazing to large herds of cattle, sheep and goats.