Chapter 1
Geography of Bangladesh
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Introduction

Bengal forms the capstone of the arch formed by the Bay of Bengal, and because of the Tibetan massif to the north it is a comparatively narrow land bridge between the subcontinent of India and the subcontinent of Southeast Asia. It has therefore a strategic position in South Asia. To place it more precisely the People's Republic of Bangladesh stretches between latitudes 20° 3' N and 26° 7' S N and longitudes 88° 0' and 92° 7 E. The country is bounded on the west, north, and last by India and in extreme south east by Burma. Bay of Bengal lies to the South. Streams and estuaries cover about 6%. Bangladesh is one of the most densely populated countries in the world having a population of about 130 million at present within a total surface area of 147,570 sq. km. The density of population is 850 per sq. km, which is one of the highest in the world. The annual growth rate of population is 1.7 per cent, which has gradually declined in the recent years. Hence there is a lot of pressure on the limited resources of the country---land and water. Again it has been calculated that if this trend continues then the population of Bangladesh will be about 180 million by the year 2025. The long-term water vision for Bangladesh is to attain food self-sufficiency by this year. This will ask for unhindered flow in the 57 border rivers during dry season. Some of the biggest rivers in the world flow through the country and form the largest delta in the world. The total annual flow of the river system in Bangladesh is about 1,511,000 million cubic meters of which 1,360,000 million cubic meters (90%) originate outside Bangladesh. During the wet season there is plenty of water, the rate of flow depending on the amount of snowmelt in the Himalayas and rainfall in the entire catchment area of the rivers (Bangladesh-Nepal joint Study team, 1989). The country receives a normal annual rainfall from 1200mm in the extreme west to as high as 5800 mm in the Northeast. The average annual rainfall is about 2300 mm. About 81% of rainfall occur in the four humid months from June to Sept. Localized rainfall of long duration in the monsoon season often generates localized floods due to drainage congestion. However such floods may take a catastrophic dimension when combine with runoff carried by the three major rivers from transboundary catchment in India, Nepal and Bhutan. The opposite happens in Dry season; in almost every year the average rainfall is so low and the flow of rivers go down so much that in certain areas of Bangladesh this situation seriously disrupts the normal economic life.

1 Tauhidul Anwar Khan, "Water resources situation in Bangladesh", Paper presented at Regional Symposium on Water resources Policy in Agro-Socio-Economic development(Dhaka, August 4-8, 1986)p28.
The modern geographical study of Bengal may be said to have begun with James Rennell's Memoris of a Map of Hindoostan (Rennell 1792). However, almost a century passed before a properly compiled, statistically substantiated account of Bengal was published in eight volumes by W. W. Hunter (1875-77). This invaluable work has earned Hunter the right to be considered the first regional and historical geographer of modern Bengal.

**Geological Basis**

It is only within the last twenty years that a considerable amount or data essentially supporting Wegener's theory of the movement of the continents has been collected. The crust of the earth, according to the recently developed theory of plate tectonics is thought to be divided into a number of plates, each of which is considered to behave as a relatively rigid unit. These plates shift due to sea-floor spreading and subduction. It now seems that the continental masses collected together, broke up and re-formed several times during the four and a half billion years of earth history. In the early Triassic Period (225 to 190 million years ago) most of the earth's land formed a single continental mass, called Pangaea, and was surrounded by one ocean, called Panthalassa. The latest continental break up occurred about 200 million years ago, and the plates began moving in different directions. Pangaea split first into two masses known as Laurasia and Gondwana. Laurasia later broke into three, the western-most forming North America and the eastern two forming most of the Asian-European landmass. Most of the Asian mass, it is postulated, is carried on two plates, the Eurasian and the East Asian. In the Jurassic Period (190 to 136 million years ago) the Indian portion of the Gondwana mass split off and began moving north towards Asia.

Apparently the Indian portion of Gondwana is on the same plate as the continent of Australia and both areas moved north as this plate shifted position due to sea-floor spreading in the newly formed Indian Ocean. The Indian portion however swung north faster and collided with the East Asian and Eurasian plates in the Eocene Period (54 to 38 million years ago). One of the results of this collision is the raising of the Himalayas and the Arakan Yomas. The Indo-Australian plate is subducted under the East Asian plate along the line or the Himalayas, but under the Arakan Yomas the two plates are only rubbing against each other along a transform fault (Fig 1-1).

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In the Oligocene Period (38 to 26 million years ago), some time after the plates collided, a portion of the north eastern part of India fractured and sank below sea-level. This portion was filled up over [be next 37 million years to form the Bengal Basin(Fig1-2). Bangladesh is therefore formed on a mass of sediments underlain by the very old rocks of the Gondwana continent. On two sides of the Bengal Basin the old rocks crop up, in the east as the Meghalaya plateau and in the west as the Chhota Nagpur plateau. The narrow part of the Basin, in-between these two plateaux, is known as the Garo-Rajmahal gap. Along the line of this gap the old base rocks come closest to the surface in Rangpur and Naogaon. Due to its position, with one of the world's major subduction faults in the north and a major transform fault in the east, the Bengal Basin and its adjacent areas form one of the most active tectonic regions of the world. Large areas within Bangladesh have been uplifted in recent times and some areas are still sinking. It has been postulated that these tectonic may be due to the presence of a major fault at depth or a subsiding trough along the axis of the Jamuna-Podda-Meghna river system. This subsiding structural zone may be the foredeep of the transform fault in the east.

The Bengal Basin has been filled by sediments washed down from the highlands on three sides of it, and especially from the Himalayas, where the slopes are steeper and the rocks less consolidated. The greater art of this land-building process must have been due to the Ganges and Brahmaputra rivers. Fig 1-3

Physical Features

The origin of the Ganges and Indus rivers is much debated. On the evidence of the Siwalik deposits (between 1 to 12 million years old) in the Indo-Gangetic Valley, B. H. Pascoe (1919) and O. B. Pilgrim (1919) advanced the hypothesis of an Indo-Brahin or Siwalik river flowing westward and southward to Sind and draining the vast plains. Post-Siwalik movements are said to have dismembered this river which broke up into the Indus, Ganges and Brahmaputra. The latter two reversed their flow and found a new course to the sea through the Garo-Rajmahal gap. This theory has been challenged Krishnan and Aiyengar 1940, but not seriously shaken. If accepted, it means that most of the Bengal Basin formed on the reversal of the Indo-Brahin in the Pliocene period (7 to 25 million years ago). The hills to the east -mostly the outer ranges of the Arakan Yomas-date from the middle Miocene to the Pleistocene. In this latter period much of the Bengal

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Figure 1-2

BENGAL BASIN

HIMALAYS

MEGHALAYA PLATEAU

RAJMAHAL HILLS

DACCA

CHITTAGONG REGION

BAY OF BENGAL
Figure 1-3

Land-forms of the Bengal delta. Source: Umitsu (1985)
Basin was complete: large remnants of it remain as the Barind Tract of the Northern Region and the Madhupur Tract of the Central Region. There are other scattered bits such as the Tripura Hills Piedmont. Much of the Pleistocene deposits have either been eroded away or have sunk below recent alluvial deposits, which cover three-fourths or Bangladesh. Most of the deltaic southern part of the Bengal Basin is probably not more than 10,000 years old.

Physiographic Sub-Regions
Spate (1954) outlined five physiographic sub-regions in the Bengal Basin. Of these, three only (11, III and V) fall in Bangladesh. He further sub-divided the Delta (V) into three parts-Moribund, Mature and Active.¹⁰ His outline regions were elaborated upon by B. L. C. Johnson (1957), who divided Bangladesh into five regions, with twelve subdivisions. The hillocks and mountains of Syihet District and the Chittagong Region were left out completely. He recognized the individuality of what he named the Noakhali-Tippera Clay Plain.¹¹

Physiographic Subdivisions
Morgan and McIntire brought out the fourfold division of the Barind and the Piedmont nature of the alluvial plains to the north. The divisions and subdivisions listed, are based mainly on topographical features, and partly on considerations of drainage pattern, soil associations, morphology and landuse patterns.¹²

Bangladesh can be divided into the following twenty-four sub-regions, with fifty-four units on the basis of physical features and drainage pattern (Fig 1-4):

I. Himalayan Piedmont Plains;
II. Tista Floodplain;
III. Barind Tract:
   (a) North-eastern outliners
   (b) Eastern Barind
   (c) East-Central Barind
   (d) West-Central Barind
   (e) Western Barind
IV. Little Jamuna Floodplain;
V. Middle Atrai Floodplain;
VI. Lower Purnabhaba Valley;

VII. Bhar Basin:
(a) Western
(b) Eastern

VIII. Lower Mahananda Floodplain;

IX. Ganges Floodplain:
(a) Diaras and Chars;
(b) North Ganges old floodplain

X. Brahmaputra-Jamuna Floodplain:
(a) Bangali-Karatoa floodplain;
(b) Diaras and Chars;
(c) Jamuna-Kaliganaga floodplain

XI. Old Brahmaputra Floodplain;

XII. (a) High ridges
(b) Floodplain complex
(c) Western plain
(d) Northern plain
(e) Southern plain
(f) Eastern plain
(g) South eastern plain

XII. Susang Hills and Piedmont:
(a) Susang Hills
(b) Piedmont plain

XIII. Madhupur Tract:
(a) Northern tract
(b) Central tract
(c) Southern tract
(d) Eastern tract

XIV. Haor Basin:
(a) Central basin
(b) Susang Piedmont basins
(c) Meghalaya Piedmont depression
(d) Central Sylhet lowland

XV. Sylhet High Plains;
XVI Sylhet Hills:
(a) Meghalaya foot hills
(b) Tila ranges

XII Meghna Flood Plain:
(a) Titas Basin low plain
(b) Meghna-Lakkha Doab
(c) Middle Meghna floodplain

XVIII Tippera Surface:
(a) Eastern Piedmont strip and Lalmai range
(b) Low floodplain
(c) High floodplain

XIX Moribund Delta;

XX Central Delta Basins;

XXI. Immature Delta;

XXII. Mature Delta:
(a) Old Ganges floodplain
(b) Podda-Madhumati floodplain
(c) Non-saline tidal floodplain
(d) Saline tidal floodplain

XXIII. Active Delta:
(a) Active Podda floodplain
(b) Mehendiganj islands
(c) Meghna estuary islands and Chars
(d) Meghna estuarine floodplain

XXIV Chittagong Region:
(a) Northern Coastal Plains
(b) Central Valley
(c) Matamori delta and coastal islands
(d) Western hills
(e) Middle Karnafuli System valleys
(f) Bakkhali river valley
(g) Southern Beach plain
(h) Nhila-Teknaf plains
(i) Jinjira islets and reefs
I. **HIMALAYAN PIEDMONT PLAINS**

These plains, rolling in parts, are the alluvial cones of the many rivers issuing from the terai region at the foot of the Himalayan ranges. This sub-region is bounded by the Mahananda river in the west and Dinajpur Karatoa in the east. In the north, it merges with the sub-montane terai, known here as the Duars (Spates Region). The rivers in this sub-region are entrenched in the recent alluvial deposits, mostly sandy silt.

II. **TISTA FLOODPLAIN**

This big sub-region stretches from the high sandy levees of the Dinajpur-Karatoa to the right bank of the Brahmaputra. Most of the land is shallowly flooded. There is a slight depression along the Ghaghat river, where flooding is of medium depth. The big river courses cut through the plain, that of the Tista, the Dharla and the Dudkumar. The active floodplain of these rivers, with their sandbanks and diaras, is usually less than four miles wide.

III. **BARIND TRACT**

The Barind Tract is one of the several terraces of Pleistocene age within the Bengal Basin. It is cut through by several rivers, of which three have carved valleys wide enough to separate it into four parts. This tract is characterized by its comparatively high elevation, reddish and yellowish clay soils (Khiyar in local terminology), entrenched dendritic stream pattern and a relative paucity of vegetation.

(a) **Northeastern outliners:** Three separate sections of the Barind Tract are surrounded by Tista deposits. These outliners differ from the main Tract in having deep reddish brown soils. The relief is that of an almost level highland, except around Ahshula Bil where it is irregular.

(b) **Eastern Barind:** In the north, the eastern and east-central parts of the Barind are nearly joined together, for the dividing line between them, the Western Jamuna river is very narrow from Hill northwards. From this place southwards, the valley of this river is much wider. In the north this part of the Barind extends up to Darwani and Badarganj; The northeastern boundary is roughly a line drawn from a point between Badarganj and Shampur to Gobindaganj. From there, the tract is bounded on the east by the Bogra-Karatoa river down to Taras Thana. The southern margin cuts to the north-west till the Western Jamuna river. The area thus enclosed is roughly 1,200 square miles, and cover the whole or parts of the thanas of Taras, Singra, Nandigram, Raninagar, Adamdighi, Kahaloo, Khetlal, Sherpur, Bogra, Dupchanchia, Shibganj, Panchbibi, Joypurhat, Gobindaganj, Palashbari, Pirganj, Mithapukar, Badarganj, Saidpur,
Parbatipur, Nawabganj (R), Ghoraghat and Hakimpur. This part of the Barind is mainly a level plain, with few undulations. One portion of this terrace in the north-east is cut off from the rest by the Karatoa fault.

(c) **The East-Central Barind:** The East-Central Barind is the narrowest of the four parts, being only seven miles in average width. Its length is sixty miles, from Chirirbandar Thana to Mahadebpur Thana. Out of its 420 sq. miles, 315 sq. miles are in Bangladesh. The whole of the western side of this section of the Barind is bounded by the Atrai river valley. In the south, it ends abruptly in the low Bhar Basin. Between Parbatipur and Chirirbandar in the north, the height is 127 ft. There are some undulations in this stretch of the Barind.

(d) **West-Central Barind:** This large section of the terrace is ninety miles long, and varies from ten to twenty-three miles in breadth. 1,100 sq. miles of it is in Bangladesh. It slopes up through the recent alluvial deposits of the Piedmont plains just south of Dinajpur, and continues in an unbroken mass to the Ganges river, where it appears as a stiff high northern (left) bank for about five miles. A bit of it appears east of Dinajpur Town between the Kankra and Atari rivers. This part of the terrace covers almost the whole of Godagari, Tanor, Niamatpur, Nachole and Porsha Thanas, and parts of Dinajpur, Mahadebpur, Gomastapur, Chapai-Nawabganj and Pabthan as.

(e) **Western Barind:** Four small sections (in all comprising .56 sq. miles) of the Western Barind projects into Bangladesh, in Gomastapur and Porsha Thanas, along the Purnabahaba and Tangon rivers.

IV. **LITTLE JAMUNA FLOODPLAIN**

The little Jamuna was once a large river, being one of the former channels of the Tista. Its valley is very narrow in Dinajpur District, but south of Hill it is from 5 to 1 miles wide. The recent alluvial soil is a grayish sandy-silt and greatly contrasts with the clays of the Barind. It is 10 to 15 feet thick, underneath which the reddish clays appear. The valley terminates in the Bils (depressions, mostly water filled) in south Naogoan Thana. It covers all, or parts of Thanas Phulbari, Joypurhat, Panchbibi, Adamdighi, Dhamoirhat, Patnitola, Badalgachhi. Mahadebpur and Naogaon. It reaches its widest extent in Badalgachhi, Joypurhat and Panchbibi Thanas. The area of the valley is about 400 sq. miles of which 330 sq. miles is in Bangladesh.

V. **MIDDLE ATRAI FLOODPLAIN**

This is a 50 mile long valley stretching from Chirarbandar to Mahadebpur, with the Barind Tract rising on both sides. Only half of the valley is in Bangladesh. Flash floods bring down considerable amounts of sand and much of the floodplain has sandy soils.

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VI. LOWER PURNABHAHA RIVER VALLEY

This valley, separating the West-Central Barind from the Western Barind begins 16 miles south of Dinajpur town, in Indian Dinajpur District. It ends at Rohanpur in Gomastapur Thana where the Purnabhaba river joins the Mahananda river. It is 50 miles long and 2 to 5 miles broad. Locally the valley is known as Duba i.e. swampy. Due to imperfect drainage this valley is not so fertile as those to the east of it.

VII. BHAR BASIN

The bhar (which means 'lowland') is the very low land in Atrai Thana. It can, however, be conveniently used to name the whole of the depression south of the Barind Tract. This 1,200 sq. miles basin can be divided into two parts, on the basis of their relative height, and thus the normal depth to which they are inundated.

(a) Western: The drainage of its western half collects around the large Chalan Bil, from where it passes through the broad sheet of water known as the Failam, into several other water bodies and finally flows into the Jamuna river through the Hurasagar river. Much of this basin is silting up, for here the many north-south streams coming through the Barind are checked and turned southeast. Due to the rapid change in course, these rivers and streams deposit much of their silt here. and as they choke, they change course only to silt up elsewhere.

(b) Eastern: This part of the basin has more ridges. However, most of the land is deeply flooded in the rainy season. There is some influx of water from the Ganges when it is in flood.

VIII. LOWER MAHANANDA GANGES FLOODPLAIN

The Mahananda river forms the western boundary of Bangladesh in two places along the Piedmont Plain in Dinajpur District. Further south, it flows along the northern side of Bholahat Thana and enters Bangladesh in Gomastapur Thana and winding through Chapai-Nawabganj Sub-Division. It falls into the Ganges south of Chapai- Nawabganj Town. The course below Chapai Nawabganj is in the Ganges Floodplain. Above it, the Mahananda varies in breadth from 5 to 7 miles west of the river and 1 to 3 miles east of it. This 250 sq. miles floodplain lies between the Barind and the Ganges floodplain. The river is slightly entrenched.

IX. GANGES FLOODPLAIN

Throughout this work that stretch of the Ganges river, below its confluence with the Brahmaputra, is referred to as Podda.

(a) Diaras and Chars: By Diara the low bank of a river is generally meant. Here it is used for any alluvial accretion on the banks of any water body. Though Char means any accretion in a river; here it is used only for islets in the rivers. In such a large river as the
Ganges, Diaras and Chars are plentiful. These accretions are, however, very rarely permanent, for courses of rivers in low alluvial plains are very liable to shift across their flood plains. These Diaras and Chars often first appear as thin slivers of sand. On this is deposited layers of silt till a low bank is consolidated. Certain Chars and Diaras appear very substantial while others appear to be mere sand or mud-banks. Some are very flat, while others are undulating. As a general rule, the accretions in the upper courses of the rivers within Bangladesh are sandy, those in the middle courses are silty, and those in the lower courses have a high proportion of clay. The Ganges, Diaras and Chars within Bangladesh stretch from the southwest of Shibganj Thana to the south of Bera Thana, a distance of 165 winding miles. There are large Diaras south-west and south-east of Shibpur Thana, north of Daulatpur Thana and south of Charghat; Ishurdi, Pabna and Shujanagar Thanas. Chars are numerous and shifting very often. The principal ones are south of Rajshahi and Shujanagar Thanas.

(b) North Ganges old floodplain: This broad high floodplain stretches from Premtali in Godagari Thana to Shujanagar Thana where it slopes into the Jamuna floodplain. The southern part covers Bagatipara, eastern Paba, northern Puthia, Duragapur, Mohanpur and southern Bagmara Thanas. The land here is a succession of saucer-shaped basins, rimmed by old river levees and point bars.

X BRAHMAPUTRA-JAMUNA FLOODPLAIN

A dual name is used for the mighty Brahmaputra river, because the Jamuna channel is comparatively new and this course must be clearly distinguished from that of the older Brahmaputra (Region XI). Before 1787, the Brahmaputra's course swung east to follow the course of the present old Brahmaputra (Fig 1-5). In that year, apparently, a severe flood had the effect of turning the course southwards along the Jenai and Konai rivers to form the broad, braided Jamuna channel. The change in course seems to have been completed by 1830. Fergusson (1863) suggested that the diversion may have been due to the uplift of the Madhupur Tract. La Touche (1919) disagreed, and suggested that the change in course was directly due to an increase in the volume of water carried, when the Dihang tributary of the Brahmaputra cut back and beheaded the Tsangpo river of Tibet and thereby received an 'enormous accession of water'. However, that the Tsangpo, which flows through a dry plateau, is a small river by the standard of those in the Indian sub-continent, does not seem to have occurred to him. The accession of even two or three hundred thousand cusecs could not have made such a difference to

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Figure 1-5

FAULTS AND TECTONIC MOVEMENTS

- Dotted line: Old course of Ganges
- Solid line: Fault line

SCALE

0 20 40 60 80 100 MILES
0 20 40 60 80 100 120 KILOMETERS

BAY OF BENGAL
a river which was even then well over a mile broad in its course through Mymensingh. Hirst (1916) advanced the more plausible concept of a zone of subsidence between the two large Pleistocene blocks of the Barind and Madhupur. He suggested that these two blocks had been elevated 'as compensation to a line of subsidence passing approximately from Jalpaiguri to the sea, down the alignment of the present Meghna river'. Hayden and Pascoe (1919) strongly attacked this concept and accepted the 'rational' explanation of La Touche, which since then was not seriously challenged till the findings of Morgan and McIntire (1959). In their stimulating paper, they put forward four points as evidence that there is most likely a zone of subsidence between the two large Pleistocene blocks. Firstly, the change in the course of the Brahmaputra is in response to a steeper gradient along the course of the present Jamuna. This gradient must have increased sufficiently by the 1780s to need only the trigger action of a single flood to divert the river. Secondly, there are faults on both sides of the hypothetical zone; there are six echelon faults west of the Madhupur Tract and a large fault northeast of the Barind Tract. Thirdly, the hypothetical Garo-Raimahal gap stretched across the Northern Region, and sank only in the Oligocene period, and is quite possibly an unstable mass. Fourthly, the vast amount of sediment carried to sea by the Meghna river (the main mouth of the combined Ganges- Brahmaputra-Meghna rivers) for the last 200 years, at the least, has not built out the deltaic front appreciably. Subsidence in the estuary of the Meghna possibly hinders the rapid building of islands and Diaras. On the evidence available, Morgan and McIntire accept and elaborate upon the theory of a zone of subsidence between the Barind and Madhupur Tracts, which in turn elevates the two tracts on either side.

**Bangali-Karatoa floodplain**: This plain was once a part of the Tista floodplain and now through the bangali distributary of the Jamuna it is part of a bigger floodplain. The relief is that of broad ridges and basins.

(a) **Diaras and Chars**: Along the Brahmaputra Jamuna, as along the Ganges, there are many Diaras and Chars. In fact there are more of them along this channel than in any other river in Bangladesh. The largest of these are in Rahumari Thana where they form most of the land between the river and the abrupt faulted western end of the Meghalaya Plateau.

(e) **Jamuna-Kaliganga floodplain**: This is the left bank floodplain of the Brahmaputra-Jamuna. Several distributaries of the Jamuna flow through here. The Kaliganga is by far the largest of them.

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XI. OLD BRAHMAPUTRA FLOODPLAIN

When the Brahmaputra turned south and adopted the Jamuna as its main channel, the old course between Bahadurabad and Bhairab shrank through silting into a small seasonal channel only a quarter of a mile broad. The old river had already built up fairly high levees on either side over which the present river rairly spills.

(a) **High rides:** This sub-region begins at the foot of the Garo bills and curves along the old course of the Brahmaputra to end near Nakla. The relief here is of broad and narrow, high floodplain ridges, with lower ridges and inter-ridge depressions between them.

(b) **Floodplain complex:** This long and narrow subregion follows the course of the old Brahmaputra and has a relief of irregular ridges and depressions with some extensive areas or smooth ridges and basins. The higher ridges are on the northern side.

(c) **Western plain:** This part of the plains is cut off from the southern section by an arm of the old Brahmaputra. The active floodplain all around floods fairly deeply but most of this plain is only shallowly flooded within the rice field bunds.

(d) **Northern plain:** This large sub-region is roughly in the shape of a broad T, the east-west arm extending 70 miles from Mohanganj to Sherpur, and the north-south arm extending 60 miles from Purbadhala to Katiadi. This plain also has a relief of broad ridges and basins, locally irregular along old channels. Basins are usually flooded more than 3 feet deep, but the ridges are only shallowly flooded.

(e) **Southern plain:** This large section extends from the Brahmaputra-Jamuna to the old Brahmaputra and almost encloses the northern part of the Madhupur Tract. The relief is that of broad ridges and basins except along the Modhupur Tract where it is often undulating. The plain is almost divided in half just east of Jamalpur, where seven broad undulations of the floodplain complex almost join the northern-most spur of the Madhupur Tract. There are a few fairly deep basins within the plain, of which the one at Moshakhali is most prominent.

(f) **Eastern plain:** This sub-region has the broad ridges or the northern plain, but the basins are deeper. The higher ridges are only shallowly flooded but all the basins are flooded more than 3 feet deep. Most soils have a strongly developed ploughpan impeding internal drainage.

(g) **South-eastern plain:** This section is a continuation of Northern plain across the Old Brahmaputra. There are numerous small sandy patches on the ridges. Most of the area is only very shallowly flooded within the field punds. This plain contains several outliers of the Madhupur Tract, including the Eastern Sub-region (XIII. d).

XII. SUSANG HILLS AND PIEDMONT
(a) **Susang Hills:** This region extends in a thin line of some 100 miles length from the north of Jamalpur Sub-Division to the north of Sunamganj Sub-Division. It includes the hillocks at the base of the Meghalaya Plateau, which are within Bangladesh, and the land in between and around them, which is high and beds arid outcrops of rocks of the Jaintia Series of the Eocene age. The highest of the hillocks within Bangladesh are over 300 ft. The valleys are at a height of over 100-ft. Many entrenched mountain streams cut through this region, depositing sand plentifully. Over much of its length this narrow belt gives way very rapidly to low waterlogged land. In the eastern part of this region, the Meghalaya Plateau ends abruptly in a series of gigantic faults, over 2,000 ft. in height, and the narrow gravelly ledge at its base sinks down to the very low Haor Basin.

(b) **Piedmont Plains:** This sub-region covers most of Nalitabarai, Haluaghat and Kalmakanda thanas and part of Durgapur.

XIII. **MADHUPUR TRACT**

Like the Barind, this is another large Pleistocene inline within the Basin, with an area of about 1,590 sq. miles. It is tilted towards the south-east.

(a) **Northern Tract:** The northern end of the tract (Figure 1-3) is characterized by its large plateau like hillocks known as Chala. They are 30 to 60 feet in elevation and have slightly dome-shaped tops. Between them are narrow winding valleys (mostly flattened and terraced for rice cultivation) known as Baid. The drainage pattern is dendritic.

(b) **Central Tract:** This area can be divided into two parts. The eastern part of the block, about 150 sq. miles in area is bound on its west by a fault downthrown on the eastern side. It is characterized by chains of Chalas, with not very broad tops, and deep circular Bais, most of which are not connected with each other. The drainage pattern is, dendritic.

(c) **Southern Tract:** The large southern sub-region has topography different from that of the other four sub-regions. Here, most of the terrace is almost flat in relief, except where streams have cut across it. The leveling for rice fields has gone a long way towards making the relief uniform. Besides the streams and especially along the Lakkha river, the terrace presents a marked elevation because of the entrenched drainage pattern and the dissected nature of the tract. In the south, the tract reaches the Buriganga and a small bit of it has been traced on the other bank. The level here (in and around Dhaka City) is uniform mainly due to artificial leveling. There are extensive waterlogged Bais in the eastern part.

(d) **Eastern Tract:** Three bits of the terrace are detached from the main Tract by the Old Brahmaputra and Lakkha rivers. The southernmost, at Sunargaon, is very small. The northernmost at Egaro Shindur, is also small. South-east of the latter area is the third, fairly large,
block in Monohardi and Shibpur Thanas. The drainage in this sub-region is not markedly dendritic. But definitely entrenched.

XIV. HAOR BASIN

This large basin takes its name from the multitude of large lake-like bodies, known as Haor, with which it is dotted. This sub-region stretches from the Mahadeo and Mogra rivers to the plain of Central Sylhet. The area covered by the basin is about 2,800 sq. miles.

**Central Basin:** In the basin there are two very low areas: one near Sulla, more or less in the center of the basin and the other along the north-central rim. The low area near Sulla and Khaliajuri has large tracts below 10 feet level. Most of the basin on all sides gradually rises higher. The basin itself is a succession of Beels and Haors of various sizes, interspersed with river cutoffs, scours, swales and long higher levees known as Kandha. The Kandhas in this central area are around 20 feet level. For seven months of the year the aspect is that of a vast lake, then all but the higher Kandhas go under water. This central area covers much of Khaliajuri, Sulla, Dirai, northern Baniachang and Jamalganj Thanas. The second very low area contains the Tangua Haor, directly to the north of the center, at the foot of the Meghalaya Plateau. This area is as low as the center, but the rim lands are higher (30 feet level).

**Susang Piedmont basins:** There is a line of deep basins between the Susang piedmont plains (XIIb) and the Northern plains of the Old Brahmaputra (XI d). These basins merge into the deeper Haor areas to the east. Most of this area is seasonally deeply flooded.

Meghalaya Piedmont Depression: This long depression stretches from the Rongra river in the west to the Lubha river in the east. A large fault along the southern edge of the Meghalaya Plateau is the cause of this long low strip of land: parts of it may still be sinking.

Central Sylhet Lowland: This depression contains the Hakaluki Haors and Bils and the low-lands to its north-west and south east. The heavily silt laden Juri and Kushiara rivers are filing up the low areas and in a couple of decades the water area will be greatly reduced.

XV. SYLHET HIGH PLAINS

This region is in large measure the hither land between the three major sub-divisions of the Haor Basin. Over much of its length it is above 30 feet and the streams are fairly entrenched. In some parts there are Haors and Bils, but their level is higher than those of the Haor Basin and most of them drain out in early winter.

XVI. SYLHET HILLS

Small areas of the Meghalaya Plateau foot-hills fall within Bangladesh. To the south of them there are four small hilly tracts and five hill ranges.
(a) **Meghalaya Foot-Hills**: Along the northern border or Sylhet District, some of the foot-hills of the Meghalaya Plateau (the Khasi and Jaintia hills part) are within Bangladesh. Very small bits are within the border to the north of Tahirpur. North-east of Sunamganj there is an area of scattered hills both west and east of the Khasimara river. The Chhatak Hills to the south-east are actually a continuation of these. Further east there are two hills, one reaching 171 feet, close to Bholaganj. To the east of the Piyain river there is a five mile long hill area known as Jaflong. Here heights reach over 200 ft. To the south-east there is a continuous hilly area from Jaintiapur down to the point where the Surma river forms the border with India. Here the main hill groups are Jaintiapur (up to 176 feet), Shari (Dupi Tila 299 feet), Lalakhal (Kesara Pahar 501 feet), Bariyal (265 feet), Sonatan Pahar (294 feet), Numchara (over 200 feet), Lubhachara (over 300 ft.), Mulagul (Khasia Tila, 327 ft. and Chatal Tila, over 400 ft.), Dawkergul (263 ft.), and Dona (over 250 ft.).

(b) **Tila Ranges**: Tila is the name given to small hillocks in northern Sylhet. There are four main groups of hillocks in northern Sylhet District. The group at Chhatak has an area of 25 square miles. It reaches heights of 146 and 144 feet (Taramun Tila). The group of Tilas at Sylhet form fairly well defined ranges with a north-east to south-west trend. South of the Surma river the highest point is Orthoki Tila (94'), North of the river the main heights are Abangi Tila (251'). Barutni Tila (260') and Cherragong (300'). A few miles to the south-east is the 30 square mile Dhakadakhin group of Tilas which reaches up to 209 feet at Kailash Tila and over 200 north of the Surma river. A few miles to the east of this group are the Tilas of Beani Bazar, which cover 20 square miles and reach over 100 feet in places. Six hill ranges project into the south of Sylhet District from the Indian State of Tripura. These ranges are, in a sense, the continuation of those which traverse the Chittagong Region in the south-east. These six ranges, which project into the plains from the south are, from east to west, the Patharia, Harargaj, Rajkandi-Ita, Bhanugach, Tarap and Raghunandan.

**XVII. MEGHNA FLOODPLAIN**

Much of the flood-plain of the Meghna was built up by the Old Brahmaputra river, when that carried the main stream. The Meghna continues to fill in the depressions left since then but is not building up any more north of its confluence with the Dholeswari.

(a) **Titas Basin**: This plain is flooded by the Titas distributary of the Megan, which leaves it near Chattlapur and rejoins it near Nabinagar.

(b) **Megan-Lakka Doab**: This large piece of land includes part of the Lake-Banish Dab to the west. This Doab is low and very fertile.
(c) Middle Meghna floodplain: Along the middle Meghna river, as is to be expected, there are many large Chars and Diaras, separated from those to the south because the latter are part of the Delta, while the former are not.

XVIII. TIPPERA SURFACE

The Tippera surface (named by Morgan and McIntire) or the Tippera-Noakhali Clay Plain (according to B.L.C. Johnson), is a distinctive physiographic unit. The soil is slightly more oxidized than the flood-plain deposits. According to Morgan and McIntire (1959) the surface reappears to the north at Habiganj, where it is limited on the north by a north-east to south-west fault trace. Fig 1-6

(a) Eastern Piedmont Strip and Lalmai Range: This is a narrow strip of land along the base of the Tripura Hills, which are within India. The Lalmai range, a couple of miles west of Comilla town, is 9 miles in length and from half to one and a half miles wide. Its highest peaks are over 150 feet. It is bounded by faults on the western and eastern sides.

(b) Low floodplain: This long floodplain stretches from Nabinagar south to Maijdi. The relief is that of almost level broad ridges and basins, mainly deeply flooded by accumulated rainwater in the monsoon. Flooding is caused by the Meghna and also by the smaller rivers such as the Gumti and Dakatia. A long depression from Kachua to Maijdi marks an area of deeper flooding.

(c) High floodplain: This sub-region is mainly shallowly flooded, except in the extension in the north to Nabinagar, where half the land is deeply flooded. There is also a long, narrow depression along the Dakatia-Little Feni river which is seasonally deeply flooded. West of the Lalmai Hills there is some man-made raised land. Flash floods occur, especially in the Gumti and Silonia rivers. The Comilla Basin between the Lalmai range and the Tripura Hills is probably a graben.

XIX. MORIBUND DELTA

The Moribund part of this Delta is characterized by rivers choked with sand and unable to carry much water except when the Ganges is in high flood; a profusion of ox-bow lakes; high plains well above normal flood-level, and interfluve depressions which are not filling up because of the absence of the annual spread of sediments (silt) which is of such great importance in the active part of the delta.

XX. CENTRAL DELTA BASINS

These large basins (also known as the Faridpur Bil Area) are about 1.200 Sc. miles in area. The origin of the Central Delta Basins, with their extensive Bils, lies probably in the absence of rapid deposition by the active distributaries (which flow towards its east) coupled with steady subsidence due to warping by torsional forces. The associated slightly higher land to the south of
Figure 1-6

TIPPERA SURFACE DRAINAGE PATTERN
these Bils has been explained by Strickland (1940) as the zone where the rise of the tide has led to the rapid deposition of silt carried by the once active rivers.

**XXI. Immature Delta**

South of the Mature Delta, there is a broad belt of land, barely above sea level. Where as the height of the southern edge of the Mature Delta is about 8 ft., the height a few miles to its south is only 3 ft. This very low land of some 3,000 mile area, contains the Sunderbans forest and the Sunderbans reclaimed estates (cultivated land). There are two possible causes for the existence of such a large very low estuarine area-insufficient deposition by the Ganges distributaries or subsidence. Till the seventeenth century the main Ganges distributary seems to have been the Hoogly-Bhagirathi. In the next century the Ganges sent more and more water down its more eastern distributaries, till the 1787 flood and the break-through of the Jamuna forced it back and the Gorai distributary was enlarged. The Ganges subsequently once again shifted east. Between the Hoogly- Bhagirathi and the Gorai (and its continuation, the Madhumati) the Ganges had two main distributaries, the Ichamati and the Bhairab, neither of which built up more than their own levees. The Jalangi and Mathabhanga rivers cut across the drainage lines of these rivers in the eighteenth century, but their work lasted only about a century. It seems, therefore, that the main distributaries of the Ganges never flowed through this region, and the small ones that did lasted a few centuries at most. The building up of this estuarine area is consequently not complete. The tides may have also contributed to the retardation by forcing the major part of the sediments to be deposited along the ledge, which extends from the levee of the Madhumati and Narail Thana west south westwards to the Hoogly-Bhagirathi at Calcutta.

It is also possible that subsidence has played a major part in depressing this area. Most of the indications are that there has been subsidence to a maximum of 40 ft. both in this part of the Delta and in the central Delta Basin. Quite likely the Mature Delta has also been affected but that it has not sunk so low because the tidal action precipitated most of the silt of the several Ganges distributaries of that area fast enough to counteract the sinking. It seems that both the absence of adequate deposition and subsidence are responsible for the incomplete build-up of this region. The sea-ward face of this region is a network of branching streams around roughly oblong shaped islands. When silt laden streams reach the sea, their velocity is checked and their sediment load is flocculated. Bars form at the mouths, and the streams branch off to either side. In time these branches too form their bars and are also divided. As this process goes on the branches unite and redivide and the bars coalesce into islands, which are sometimes cut apart. This process forms a network of channels. The high tide ponds back the estuarine rivers and force them to break their

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banks and open out cross-channels. The sandy beach, usually facing south-west is backed by a ridge of sand dunes twenty to thirty feet high; behind this is a grassy plain, of about half-a-mile width and parallel to the beach; this plain is bordered by a belt of mud, usually with a stream and forest trees. Behind this mud-flat there is again a succession of sandy shelf (an old beach), sand dunes, grassy plain and mud flat. Some beach-ridges are as much as two miles inland. There are extensive shoals, extending ten or more miles out to sea, between the larger rivers. At the mouth of the Raimangal river, the shoals extend twenty miles from the land. Between the Haringhata and Marjata estuaries, shoals cover more than 30 square miles. A notable feature is that they are higher on their seaward sides than on their landward sides by two to three fathoms. This stretch of the coast contains the big islands of Patni and Dubla.

XXII. MATURE DELTA

(a) **Old Ganges floodplain**: This sub-region lies to the north of the present channel of the Podda and receives flood water from both the Jamuna and the Podda. This area does not receive extensive silt deposits any more, nor is it subject to much diluvion. There are extensive man-made raised land near Munshiganj and a large depression known as the Arial Bil.

(b) **Podda-Madhumati floodplain**: Land levels in this large sub-region varies considerably, from very shallowly flooded land in the north-west to deeply flooded basins in the south-west. There is some overland flooding, but the essential feature of this area is that there is neither extensive alluvion nor diluvion.

(c) **Non-saline tidal floodplain**: This sub-region differs from (b) because of the strong tidal effect. The relief is that of shallow basins, with ridges (levees) along the rivers. Most of the area is seasonally flooded, with the depth of flooding varying with the tide. In the dry season only the deeper basins continue to be tidally flooded.

(d) **Saline tidal floodplain**: Here the tidal effect is much stronger than in (c) and in the dry season the river water turns brackish. Tidal flow is strong and the scouring effect is quite noticeable. Cross-channels between the larger rivers exist, as in the Immature delta. Some basins in the interior are deeply flooded in the monsoons. Slow deposition is continuing at the mouth of the larger rivers.

XXIII. ACTIVE DELTA

(a) **Active Podda floodplain**: This area is subject to flooding, alluvion and diluvion from the Podda. It includes Chars and Diaras in and on both banks of the river.

(b) **Mehendiganj islands**: This is a Char (island) area of accretion and erosion in the large mouth of the lower Meghna. The relief is that of low floodplain ridges and basins. The land is only shallowly flooded in the monsoon but the flood-level fluctuates tidally.
Meghna Estuarine Islands and Chars: The rivers of this part of the Delta form three main estuaries, the Haringhata, the Agunmukha and the Meghna. The Haringhata has only a few sandbanks. The Agunmukha encompasses the islands of Baisdia (Rabnabad) and Rangabali and the Chars of the Dhanmanik group. There are some 120 Chars. From north to south, the main ones are Trailikya, Kalir, Shiber, Kajal, Kalmi, Manika, Kukuri-Mukuri and Andar. At the mouth of the Meghna are the really large islands of Bhola, Ramgati, Hatia and Shondip. Around these are several Chars.

Meghna Estuarine floodplain: This is an area of intermediate, level land, subject to only very shallow flooding through accumulated rainwater. It consists of a ridge of high old land in the north and large areas of new accretion in the south. Deposition by the Meghna and the Big (Boro) Feni rivers seems to be still enlarging the land area.

XXIV. CHITTAGONG REGION

This part of Bangladesh, south of the Feni river, is so different from the rest of the country that it naturally forms a region. It is the most picturesque part of the country, with tangled hills and valleys, springs, lakes, islands, some mountainous ridges and plenty of forests.

Northern Coastal Plains: The plain along the coast extends from the Feni river to the Matamori delta, a distance of 75 miles. Its breadth varies from one to ten miles. From a wide plain at Zowarganj in the north, it narrows down to a little less than a mile at Foujdarhat. Further south it forms the Patenga Peninsula on the northern bank of the Karnafuli river. Southwards the plain is narrowed down by the Jaldi Hills. This plain is composed of saline clays and most of it is affected by the tides.

Central Valley: Between the coastal ranges of Sitakund and jaldi and the hills of the Hill Tracts, there is a longitudinal valley seventy miles long and from four to sixteen miles broad. It has within it the Halda river valley in the north, the Karnafuli- Sangu Doab and the Satkania valley, stretching 15 miles south of the Sangu river. The drainage lines in this valley are not uniform;

Matamori Delta and Coastal Islands: The fast-flowing Matamori river debauches on the plains at Kakhara; ten miles further down it divides, thus forming the head of its delta. These two channels re-divide into numerous others, many of which turn back to join the main channel. Three main branches flow into the Moishkhal Channel, two of which are known as Matamori Khal and one as Bura Matamori. The V-shaped lowland with its base between Mognama and Gomatali and apex at Kakhara stands out clearly from the mountains to its east, the hills to its north and south and the coastal islands to its west. To complete its resemblance to the much larger delta to the north, there is even a small Chakaria Sunderban-a tidal forest with Keora, Baen,
Gewa, Hargoza, and other coastal vegetation. There are six islands along this coast, in addition to which there are over a dozen Chars.

Two of the islands, Ujantia and Koriardia, have not been fully raised above high water level and are still in the process of Consolidation, for which reason they are included in the Matamori delta. Of the others, Kutubdia is the northern-most. It is separated from the mainland by the two-mile-wide, turbulent, Kutubdia Channel. To the south-east of Kutubdia across the channel, is Matarbari island. It is separated from Ujantia, Koriardia and Moishkhal island by channels only a quarter of a mile broad. Its length is ten miles and average breadth two miles; its area is about 19.30 sq. miles. South-east of Matarbari, across the Kohalia Channel, is the large island of Moishkhal (Moheshkhali). It is the only island in Bangladesh with hills. To the south-south-west of Moishkhal is the small sandy recurved, compound and complex spit known as Sonadia island.

(d) Western Hills: There are fairly marked differences in the land utilization, soil characteristics, drainage pattern and even ecology of the hills and the mountain ranges of the Chittagong Region. Topographically, of course, the two big hilly areas in the north and south of this region are clearly defined from the several mountain ranges to their east. The Western Hills Sub-Region includes the Sitakund and Mara Tong ranges and the complex of hills to the south and east of Ramgarh including the eastern part of the Middle Feni river valley. The Sitakund range has a twenty-mile long ridge in the middle, which reaches 1,155 ft. at the Sitakund Peak. To the north, the high peaks on this range are Rajbari Tila (902') and Sajidhala (798'). To the south, there is an abrupt fall and in Chittagong City heights are less than 300 ft. In the Mara Tong range a height of only 370 ft. is reached. Further north-east the hills are higher. At Sitakund peak there are several hot springs. There are five broken ranges of hills between the Karnafuli river and the southern tip of Bangladesh. Just south of Chittagong City, across the Karnafuli, is an isolated hill mass, the Danga hill reaching a height of only 110 ft. at Lulu Tila. A few miles to the south of it, the Jaldi range strikes south-east and reaches a height of 29 ft. at Jaldi peak. At Chunoti, this range joins with the foothills that extend along the eastern side of the Central Valley from the Karnafuli river southwards. Here a broad mass of tangled hills and ravines are formed.

(e) Middle Karnafuli-System Valleys: Within the Hill Tracts District, the Karnafuli has several important tributaries, of which the Chengi, Kasalong and Rinkheong are the main ones. The Kasalong has a big tributary in the Maini river. The valleys of these rivers form a big, somewhat palmate, lowland between the mountain ranges (Fig 1-7). The Kaptai take formed by the Kaptai Dam has drowned almost the whole of the middle-Karnafuli valley and the lower reaches of the other four rivers. The Mahalchari or Chengi valley is between the Phoromain and Dolajeri ranges, and has a length of fifty miles with an average breadth of less than four miles. The Kasalong river
has similarly a long longitudinal valley, between the Bhuacharimain and the Chipui Tlang ranges. A considerable portion of it is there in Kaptai Lake. The Maini valley is yet another long and narrow one; it branches off to the north-north-west from the Kasalong valley and so lies between the Dolajeri and Bhuacharimain ranges. The Rinkheong valley takes off to the south-east from the middle-Karnafuli valley; it is very narrow and steep. The Kaptai Lake is one of the largest man-made lakes in the world: the official estimate is that it covers 296 sq. miles, but unofficial estimates place it at 400 sq. miles when it swells in the rainy season. In all these valleys, blue clay formed of weathered shale, and also thick bands of shale with layers of ill bedded sandstone are found.

(f) Bakkhali River Valley: The Bakkhali valley is in two parts: the upper one forms part of the Idgarh-Gorjania valley, and is just a small section of the southern hills. The lower valley is, however, a distinct break in the western part of these hills. It is twelve miles long and varies from one to ten miles in breadth. The Bakkhali river meanders through this low fertile valley in an extremely tortuous manner. Like the Feni, Karnafuli and Sangu rivers, it does not form a delta but its silt has badly effected navigation in the Moishkhal channel into which it falls.

(g) Southern Beach Plain: The Beach Plain is so called because main feature is the continuous line of sandy beaches and sand dunes backed in places by narrow coastal plains and almost throughout by hills. It extends from the Bakkhali river mouth south to the Rengadumakhal, a distance of 65 miles. It is cut across by several streams, of which the Rejukhal, Monkhali and Shilkhali are the major ones.

(h) Nhila-Teknaf Plain: The hill wash brought down by the tributaries of the Naaf river (an arm of the sea) has formed two coastal plains. The northern one (Nhila Plain) is on the western side of the Naaf river, and is backed by the Teknaf range. The southern one Teknaf Plain is near the mouth of the Naaf and has the open sea on the west. The two plains are separated only by a narrow spur of the Nytong peak.

(i) Jinjira Islets and Reefs: Jinjira is the Bengali name for those islets often marked as St. Martins on maps. These islets are five miles south-west of the tip of the Teknaf peninsula. There are three islets, joined together at low tide by sandy necks. The northern island is the main one, with an hour-glass shape and a length of 3 miles. The narrow waist is barely a couple of hundred yards wide. The two southern islets are very small. All of them are composed of lime-stone and corals with a thin mantle of sandy soil. Along the south and west shore are big coral reefs.

(j) Mountain ranges and eastern hills: All the mountain ranges of the Hill Tracts are almost hogback ridges. They rise steeply. Most of the ranges have scarps in the west, with cliffs and waterfalls. They form sharp water partings and have a trellis drainage system.
stretches of hills and hillocks in between the ranges. Four ranges, with an average elevation of over a thousand feet, strike in a north-south direction in the northern part of the Hill Tracts District. The western-most, the Phoromain range, reaches 1,518 ft. at Phoromain, 1,429 ft. at Rampahar and 1,367 ft. at Bhangamura. This range is a continuation of the hill complex south-east of Ramgarh. The next range eastwards is the Dolajeri. Its highest peak is Langtrai (1,405'). On the eastern side of this range are several high waterfalls; two of the highest have falls of 196 and 130 feet. Further east; across the Maini valley is the Bhuachari range, which rises to 2,003 feet at Changpal peak. The eastern-most, within Bangladesh, is the Chipui-Lungsir range(also known as the Barkal range). It is bounded on the east by the Tuilianpui river. Its highest peaks, from north to south, are Khantlang (2,240'), Thangnang (2,409'), Lungtian (2,266'), Chipui (1,575'), Bara Toung (1,467'), and Barkal (1,875'). This range divides into two, forty miles north of Barkal, one arm reaching the Karnafuli river at Barkal, while the other passes into Indian territory (Mizoram). South of the Karnafuli river there are seven main mountain ranges within Bangladesh. The Muranja range rises out of the Chunoti hills 3 miles east of Harbang, and strikes in a south-easterly direction. Its well-known peaks are Muranja (1,644'), Nashpo Taung (1,920') and Basitaung (2,176'). This range can be clearly seen from Cox's Bazar. South to it, is Wayla range, which reaches 1,356 ft. at Wayla Toung. Most of this range is in Burma. East of Muranja range and also roughly parallel to it are the Tyambang, Batimain and Politai ranges. The Tyambang or Chimbuk range rises south of the Sangu river and continues into Burma. Its main peaks are Lulaing (2,303'), Thainkhiang (2,930'), Kro (2,846'), Runrang (2,784') and Tindu (2,944'). On a branch of the Lulain-hal, near Lulaing peak, there is a waterfall of 350 ft. height. Near Uparampara further south, there is another high waterfall, with a drop of 150 ft. These southern ranges have a good number of waterfalls of up to 70 ft. height. Batimain range is a continuation of the low Mara Taung range north of the Karnafuli. It reaches a height of 1,725 ft. at Batitaung. The long narrow Sangu river valley is contained by these ranges. The Politai range is the southern continuation of the Phoromain. Its main peaks are Sitapahar (1,420'), Ghilachari (1,565'), Ramiu Taung (3,018'), Politai (2,724'), and Keokradang (2,900'). Near Ramiu Taung, the Batimain range joins this range. A little further south, the joint ranges merge with the Saichal Mowdok range, which is the southward continuation of the Barkal range. The Saichal range is forked in the north; the western ridge is the Bilaisari range with Bilaisari peak (1,864'). Where the fork joins is Saichal peak (2,125'). Further south the main ridge falls partly within Burma. The high peaks within Bangladesh are Waibung (2,649'), Rang Tlang (3,141'), Mowdok Tlang (2,968') and Mowdok Mual (3,292') which is on the border with Burma.
HYDROGRAPHY OF BANGLADESH

Bangladesh can be divided into seven hydrological regions considering surface water flow processes and major rivers as boundaries (FPCO, 1995). These regions are NorthWest, North Central, Northeast, Southwest, South Central, SouthEast, and Chittagong. All the regions except Chittagong region are hydraulically connected through the three major rivers. (Fig 1-8)

Past History: Migration of Course of the Major River

Analysis of history of formation of land in Bangladesh indicates that land formation of the country, over the ages, has taken place as logical consequences of the sediment deposit in the flood plains and estuaries of the major rivers and migration of the course. Changes of the land formation and river course are shown in (Fig 1-9)

In the undated Past

* The Ganges had mainly southward course and was meeting the sea at a point north of the 23° N latitude.
* The Brahmaputra was flowing by the west of the Madhupur highlands and was meeting the sea separate of the Ganges.
* The Kushiyara was meeting the sea separately.
* The coastline was to the north of the 23° latitude.

Prior to 1700 AD

* Course of the Ganges and the Brahmaputra were separate.
* The Ganges had a southeasterly course.
* The Brahmaputra was flowing by the east of the Madhupur Highlands.
* The coastline and shifted southwards to sought of the 23°N latitude.

Renee's Map, 1778

* The Ganges, flowing more easterly, joined the Brahmaputra near the present Chandler and flowed jointly with the Brahmaputra to the sea.
* The Meghna has joined the Brahmaputra near the present Bhairab Bazar.

Present River Setting

The major rivers of the Bengal basin have been subjected to drastic change, occasionally moving onto the flood plains of other rivers. The course of the Brahmaputra shifted between 1787 - 1830. According to survey conducted by Captain Wilcocks in 1830 and subsequent studies between 1830-1963 indicated that the westerly movement of the course of the Brahmaputra was a consequence of tectonic forces active in the region in conjunction with the fluvial forces associated with the large moving water bodies. The present-day course of the Brahmaputra is in
Figure 1-8

Source BANCID, Evolution of a scientific system of FF & WC., 1997

Figure: Hydrological Regions and locations of border rivers
LAND FORMATION AND RIVER COURSES

MORE THAN 2000 YRS AGO

PRIOR TO 1700 A.D

RENNELL MAP - 1776

PRESENT RIVER SETTING
equilibrium, since the Bay of Bengal has become a bay with slightly coastal erosion and aggravation of the Brahmaputra river has gradually disappeared. (Fig 1-10)

**RIVER SYSTEM IN BANGLADESH**

The pride of Bangladesh is her waterways the large network of rivers, streams and canals which total at least fifteen thousand miles in length. They consist of tiny mountain streams, winding seasonal creeks, muddy Khals (canals), some truly magnificent rivers and their tributaries and distributaries. In some places, such as Patuakhali and Barisal, the waterways are so plentiful that they form a veritable maze. The water courses are obviously not evenly distributed; they increase in numbers and size from the north-west of the Northern Region to the south east of the Southern Region. All of them, except those of the Chittagong Region, belong to one or the other three major river systems, those of Ganges, the Brahmaputra and the Surma (Fig 1-11).

**Tista.**

The Tista was the most important river of the Northern Region till 1787. Before that year it used to be the principal source of supply for the Karatoa, Atrai, Jobuneshwori and other rivers. Considerable structural changes in the Barind Region affected the Karatoa, which rapidly windled as explained earlier. This led to the Tista having a considerable amount of water left over, which it could not pass down the Atrai without causing floods. The excessive rains of 1787 brought down a vast flood of sand which choked the Atrai Channel, with the result that the Tista burst into the Ghaghat river, which is a very small one, and not finding sufficient outlet, overflowed and swept nearly the whole of Rangpur District. The flood, or rather deluge, happened in a single day, August 27th. Nearly a sixth of the population of Rangpur died in 1787, mainly due to this flood (Vas 1911). The Tista found a new outlet for itself, and it has kept more or less to this channel since then. The frequent changes of its course has left a legacy in the shape of numerous stagnant cut-off channels in the west of Rangpur, most of which are known as Mara (dead) or Buri (old) Tista. The present channel within Bangladesh is about 110 miles long, and varies from three to six hundred yards in width. It joins the mighty Brahmaputra just south of Chilmari. The danger level, rise of water beyond which leads to overflowing, and consequently floods, is at 164 feet. The minimum discharge is 4,000 cusecs and the maximum is around 35,000 cusecs (WSP 27). The name Tista, it may be mentioned, is derived from the Sanskrit word Tristrota, 'three currents', and the river, in Hindu mythology, is said to flow from the breasts of the goddess Parbati.

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Ghaghat and Bangali

West of the Tista are a number of rivers: the Ghaghat, Dhaljan, Jabuneshwori and Sarbamangla; the last three are tributary to the Brahmaputra-Jamuna. The Ghaghat is a distributary of the Tista. It flows past Rangpur and Gaibandha towns and joins the Brahmaputra a few miles north of Fulchari Chat. A distributary known as the Bangali, flows south from Ghaibandha. The Ghaghat, is, for the most part, a sluggish stream, choked with weeds. Its flow varies from 50 to 2,500 cusecs (WSP 62). The Bangali has a larger flow, which varies from 400 to 21,000 cusecs (WSP 28).

Dharla Dudhkumar

Flowing somewhat parallel to the Tista, and to its north, are the Dharla and the Dudhkumar. Both flow into the Brahmaputra. The Dharla (White) is a swift river in the rainy season, but a braided clear stream in winter. In its upper course, it is known as the Jaldhaka or Singimari. In Rangpur District, it has a small tributary in the Nilkumar, formerly a larger river. The Dharla (known as Dbola in Rangpur) has low and shelving banks and is particularly liable to change its course. In 1947, it completely diluvated the old site of Kurigram town. The Dudhkumar, known in its upper course as Sankosh, is a small river. It also flows in a south-easterly direction and into the Brahmaputra. Right on the eastern border is the Sankosh river of the Bhutan Duars. Most of this river is in India.

Karatoa

The Karatoa is an intriguing river. It was formerly the main channel of the Tista, and possibly was also a distributary of the Brahmaputra. In the Seir-ul-Mutakharin it is recorded that this river was three times the size of the Ganges when Bakhtiar Khilji invaded the Northern Region (C. 1115 AD.). It is now broken up into four distinct parts. The northern part, hereafter called the Dinajpur Karatoa, is the main source of the Atrai. It rises in a marsh in Baikanthapur in Jalpaigtiri (India), but also receives water from underground streams. From Khansama Thana its name changes to Atrai. The Dinajpur Karatoa was connected with the Rangpur Karatoa north of Khansama, but very little water passes down that channel at present. The Rangpur Karatoa rises in Saidpur Thana and flows in slight meanders south-south-eastwards to Gobindoganj Thana where the main stream turns eastwards through the Katakhali and falls into the Bangali. The portion of the former river through Shibganj Thana is dry most of the year; it effectively separates the Rangpur Karatoa from the Bogra Karatoa. The latter river flows past Bogra Town and southwards, till it joins the Bangali to make the Phuljhhor river, which falls into the Hurasagar.

The maximum discharge of the Bogra-Karatoa is below 3,000 cusecs (WSP 52). The fourth part, the Pabna-Karatoa is a moribund riverbed near Handial. Various other channels are also pointed out as those of the old Karatoa. The ancient Karatoa must have been a large river. In Venden Broucks's map of Bengal, prepared in 1660, it is shown as such, and in Major Rennell's map, prepared in 1781, it is still large. As late as 1810 Buchanan-Hamilton writes of it as 'a very considerable river'. The decline, however, came so rapidly after the 1820 flood that the old banks of the river are distinctly traceable nearly a mile apart (Gupta 1910).

Little Jamuna

West of the Rangpur and Bogra Karatoas is the Jamuna, hereafter called the Little Jamuna, to distinguish it from its giant namesake. The Little Jamuna rises in Jalpaiguri District (India) and flows more or less southwards through eastern Dinajpur District and western Bogra District and falls into the Atrai in Rajshahi District. The Tulshiganga and Chhiri Nadi, both of which drain the Eastern Barind, are its principal tributaries. The Little Jamuna, as has been mentioned earlier, has carved out its own valley in the Barind, which separates the Eastern from the East-Central Barind.

Atrai

The Atrai is west of the western Jamuna. It is the western most tributary of the Brahmaputra. Its main source is the Dinajpur Karatoa, which changes its name in Khansama Thana to Atrai. This channel bifurcates north-west of Chirirbanda and unites south-west of it. The western arm is called Gabura and the eastern is called Kankra. The re-united river is once again the Atrai, which flows almost due south to Manda Thana separating the east-central and west-central Barinds. It receives many small streams white passing through the Barind, but its floodplain there is only a couple of miles wide. From the Manda Thana, the river flows south-east. At Shutigachha the Western Jamuna joins it a few miles further down, near Atrai Railway station, the river bifurcates into the Gur and the old Atrai Channels. The old Atrai, the southern channel, flows south and then east. The Baraloi, which drains the southern Bhar Basin, joins it at this second bend. The course of the river is henceforth difficult to follow since in the very low-land of the low Bhar, rivers bifurcate and unite a number of times. The Narad and the Nandakiya join the old Atrai from the south by a number of channels. The northern channel the Gur, receives the main flow or the Nagar, which drains the southern part of the Eastern Barind near Singra. The Gur too bifurcates and each of its arms bifurcate in turn. The old Atrai is called the Gumani after

it is joined by the Nandakiya. The Gur joins it near Bahadurabad, near the eastern end of the Chalan Bil. The confluence in the rainy season is a very large sheet of water, known as Failam. The joint river is known as Gumani till the Baral joins it east of Chatmohar, from where it is known by the latter name. Thirty miles down-stream from there, the Atrai-Baral is joined by the Hujjhor (Bangali-Karatoa) : the combined stream is known as the Hurasagar, which in turn falls into the Jamuna. The whole course of the Atrai, Gumani, Baral-Hurasagar will be referred to as Atrai for simplicity's sake, unless a specific reference to one of the component parts is made. The Atrai formerly flowed into the Podda near Ratananj in Bera Thana. After the changes of 1787 no water flows down that way.

**Purnabhaba-Mahananda**

The rivers west of the Atrai are all tributary to Ganges but since they also drain the Ganges-Brahmaputra paradelta, they may be described here. The upper course of the Purnabhaba is just a few miles west of the Atrai. The main source of the former river is the Brahmanpur Bannd. It is joined by the Dhepa which also rises in a Bill. The Dhepa is also known as the Purnabhaba. From just south of Dinajpur Town this river flows between the Western and West-Central Barinds, and drains the west of the West-Central part. Its valley, as has been earlier mentioned, is from two to five miles broad. It joins the Mahananda just south of Rohanpur. Between the Purnabhaba and the Mahananda rivers are three other tributaries of the latter river, the Tangon, Kulik and Nagar. The Tangon has an entrenched Valley, even in the Piedmont Plain. Along the Kulik the land is markedly undulating. The Nagar forms the western border of Dinajpur District for many miles. The Mahananda, a major tributary of the Ganges, rises near Mahaldiram in Darjeeling District (India). It forms the western boundary of Bangladesh at Tetulia Thana and then again at Ranishankoi Thana. Flowing through India, it again forms the boundary of Bangladesh near Bholahat, then flows through Chapai Nawabganj Sub-Division and joins the Ganges south of Nawabganj town. The banks of the last portions of the Mahananda are alternately sheer and sloping, and the river is 300 to 600 yards wide, and deep. Rise of water can be 20 ft. or more within a short time during the rainy season. The average maximum flow is about 80,000 cusecs flood discharge can be over 100,000 cusecs. The winter flow, as can be expected, is only a few hundred cusecs.

**Bangali**

Before coming to the Brahmaputra itself a mention of the Bangali river is necessary. This river is a continuation of the Ghaghart river of Rangpur. It has a connection with the Jamuna in the east, and with the Karataoa (through the Katakhali) from the west at Ramnagar. Flowing south, it receives the Belai distributary from the Brahmaputra and further on bifurcates the western arm
being called Halhalia, while the eastern retains the original name. The Bangali arm receives the Manash- Madhukhari distributary of the Brahmaputra north of Dhunot and within a few miles bifurcates to send an arm due south, known as the Ichhamati (Sirajganj Ichhamati). The Bangali flows south-west from this point, and receives the Halhalia west of Dhunot and the Bogra Karatoa further south near Khanpur. The united Bangali-Karatoa, as has been mentioned earlier, is the Phulijhor, which joins the Atrai-Baral to form Hurasagar. The Sirajganj-Ichhamati is joined by the Kazipur distributary of the Brahmaputra in Kazipur Thana. The combined stream falls into the Phujhor at Nalka. The Simla Khal, an offshoot, of the Jamuna, flows east of Sirajganj town and joins the Dhanbandi, another Jamuna offshoot, which flows through that town. The Dhanbandi falls into the Hurasagar at Manpur. The Hurasagar itself is an offshoot of the Jamuna. It flows south-west, then south, and finally south-east to rejoin the Jamuna north of Bera. Its mean discharge from June to September is probably about 100,000 cusecs.  

Brahmaputra-Jamuna

The Brahmaputra-Jamuna is the second largest river in Bangladesh. In size it is gigantic. In the rainy season the river is nowhere less than two miles broad, and often four miles or more. It is, through most of its course through Bangladesh studded with islands (Chars) many of which go under water during the rainy season. One such braided portion is to the east of Kurigram Thana, where the four main channels and three islands are together seven miles in breadth. Thus by breadth alone this river qualifies as one of the largest in the world. The discharge during the rainy season is enormous, averaging 1.4 million cusecs, by which measure too, it ranks with the Amazon, Congo, La Plata, Yangtse, Mississippi and Meghna as one of the seven largest rivers. The name Brahmaputra-Jamuna is used here, because in popular parlance the Brahmaputra continues south-east (as the old Brahmaputra), and the river between Bahadurabad and Aricha is the Jamuna and not Brahmaputra. The origin of this Jamuna Channel has been explained earlier. Since the layman and most of the official agencies recognize the Jamuna as a river with some sort of difference from the Brahmaputra, the latter name is given to the stretch from Nunkhwa to Bahadurabad and the stretch whole south to Aricha is referred to as the Brahmaputra-Jamuna. The Hydrology Directorate of the Water Development Authority refers to the whole stretch as the Brahmaputra-jamuna. The total length of the Tsangpo-Brahmaputra-Jamuna river is about 1,700 miles. The total drainage area down to Aricha is 224,000 sq. miles of which 113,000 sq. miles are in Tibet, 93,000 in India and only 18,000 in Bangladesh (WSP 18).  

3 Haroun Er Rashid, “Geography of Bangladesh”, UPL, Bangladesh 1977.
Bangladesh plus those of the Dudhkumar, Dharla, and Tista, and minus those of the old Brahmaputra and Bangali. The drainage area above Bahadurabad is 207,000 sq. miles. (WSP 18). The highest recorded flood has been 2,519,000 cusecs (WSF 18). In comparison, the maximum measured flood on the Mississippi river carried about 2.4 million cusecs (Morgan & McIntyre 1959). It is estimated that the maximum discharge of the Brahmaputra-Jamuna is about 3 million cusecs. During the rainy season it brings down something like 1,200,000 tons of sediment daily, and the annual silt run-off at Bahadurabad is estimated at 735 million metric tons. Average annual flow at Bahadurabad is estimated to be 501 million acre-feet (IDA 1972). It is interesting to compare the flows of the two rivers, Brahmaputra-Jamuna and Ganges. The flow of the Ganges is in this case measured at Pakshi (WSP 2). In 1956, for example, on the 31st of May the discharge of the Brahmaputra-Jamuna was 945,000 cusecs, and that of the Ganges only 151,360 cusecs.

Table 1
Average monthly discharge of the major rivers (Million Acre-feet)

<table>
<thead>
<tr>
<th>Month</th>
<th>Ganges (Sara Bridge)</th>
<th>Brahmaputra (Bahadurabad)</th>
<th>Meghna (Bhairab Bazar)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>6.76</td>
<td>11.28</td>
<td>1.29</td>
</tr>
<tr>
<td>February</td>
<td>5.32</td>
<td>8.45</td>
<td>0.97</td>
</tr>
<tr>
<td>March</td>
<td>5.02</td>
<td>10.23</td>
<td>1.38</td>
</tr>
<tr>
<td>April</td>
<td>4.32</td>
<td>14.34</td>
<td>1.97</td>
</tr>
<tr>
<td>May</td>
<td>4.28</td>
<td>34.41</td>
<td>4.20</td>
</tr>
<tr>
<td>June</td>
<td>9.06</td>
<td>68.28</td>
<td>8.03</td>
</tr>
<tr>
<td>July</td>
<td>38.81</td>
<td>95.73</td>
<td>16.97</td>
</tr>
<tr>
<td>August</td>
<td>81.54</td>
<td>97.96</td>
<td>17.98</td>
</tr>
<tr>
<td>September</td>
<td>77.70</td>
<td>76.28</td>
<td>17.28</td>
</tr>
<tr>
<td>October</td>
<td>37.45</td>
<td>47.68</td>
<td>13.55</td>
</tr>
<tr>
<td>November</td>
<td>14.94</td>
<td>22.02</td>
<td>6.47</td>
</tr>
<tr>
<td>December</td>
<td>9.11</td>
<td>14.63</td>
<td>2.15</td>
</tr>
<tr>
<td>Annual</td>
<td>294.31</td>
<td>501.27</td>
<td>92.24</td>
</tr>
</tbody>
</table>

on the 1st of July, the flows were 1,860,000 and 695,329 cusecs, respectively. The Ganges rapidly picked up, till on the 21st of August the flows were 1,152,000 and 1,945.857 cusecs and

on the 22nd September they were, 1,450,000 and 2,028,366 cusecs respectively. The lateness of
the Ganges flood was fully evident in that year in the flows of October. On the 30th of that month
the flows were 522,000 and 1,083,793 cusecs respectively. Generally the Brahmaputra-Jamuna
brings down its flood of water from the last week of May to the first week of October, with July
and August as the months with maximum discharge. The Ganges, on the other hand is high till
the third week of October with maximum discharge in August and September. Evidently the
combined flows can be very large in August. Since the Dholeswori distributary of the Jamuna
takes off roughly the in-flow of the Hurasagar, the combined flows given below can be said to be
that at the confluence of the Ganges and Brahmaputra-Jamuna at Aricha-Goalundo. August has
always been the month when widespread flooding has been most likely. Floods from May to July
are usually due to the Brahmaputra-Jamuna and from August to October due to the combined
flows of that river and the Ganges. The Lean season flow of Ganges is much lesser than the lean
season flow of the Brahmaputra. The gradient of the Jamuna averages 1:11,850, which is, slightly
more than that of the Ganges.

Old Brahmaputra

The Old Brahmaputra takes off from the left bank of the Brahmaputra to the north of
Bahadurabad. Flowing more or less to the south-east it passes by Jamalpur and Mymensingh
towns and falls into the Meghna at Bhairab Barar. Over most of its course, the right
(southern)bank is higher than the left. Before the 1787 changes the river was a mile wide: The left
side levee can still be traced, more than half a mile from the present left bank. The flow in a river
of that size and with the given gradient could have reached a maximum of two million cusecs.
The mean discharge from the middle of May to the middle of October at Mymensingh is about
50,000 cusecs (WSP 69). The river is a quarter of a mile wide at Mymensingh town. It has two
main offshoots, the Jinai and Banar. The Jinai takes off north west of Jamalpur town, joins the
Chatlai Channel of the Jamuna end falls into that river just north of Sharishabari. The Banar is
joined to the Old Brahmaputra at Nandina, and receives quite a lot of water from it in the rainy
season. After passing the main volume of its water down the Lakha river, the Banar falls into the
Old Brahmaputra at Egaro Shindur and the latter river joins the Meghna at Bhairab Bazar.
Formerly the Kangsha was an important left bank distributary of the latter river but its head has
silted up leaving it as a seasonal stream. It flows north-east, east and then east-southeast to join

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8 Haroun ER Rashid, “Geography of Bangladesh”, 1977 opcit.
Div.,Dacca
the Dhanu. Its discharge varies from 500 to over 40,000 cusecs (WSP 61).30 The Nitai and Balach are tributary to the Kangsha. The Balach is a channel of the Someshori, which comes down from the Garo Hills and joins the Surma south-east of Kalmakanda. A large number of streams come down from the Garo Hills, of which the western Someshworri, Malijhi, Tharua, Tolongs, Bhogai and Dursha are the main ones. They drain into the Kangsha.

Dholeshori

The Lohajang river branches off from the Jamuna north-west of Tangail Town and the Dholeshori branches off seven miles to the south-west. These two join near Elashin and flow south-east as the Dholeshori (Dhaleswari). Some ten miles west of Tangail, the Jamuna receives the Hurasagar from the west. The volume of water it receives is roughly equalled by the volume taken off by the lohajang and Dholeshori. The Dholeshori bifurcates and the southern arm flows south of Manikganj and joins the main stream, which flows north of Manikganj, thirty miles to the south-east. This southern arm, the Kaliganga river, now carries more water than the Dholeshori. Just north of their confluence the river again bifurcates, the southern arm retaining the name, while the northern is called Buriganga (Old Ganges). It flows past Dacca and joins the Dholeshori at Fatulla. The Dholeshori is joined by the Lakkha at Narayanganj. The river is then very large. It, in its turn, joins the Meghna at Shaitnol, and loses its separate identity. The mean discharge of the Dholeshori in the rainy season, at Manikganj, is about 200,000 cusecs.4

Surma-Meghna

East of the Brahmaputra system of rivers is that of the Surma-Meghna. The Surma river rises as the Barak, on the southern slopes of the Naga-Manipur watershed. The Barak divides into two branches within the Cachar District of Assam (India). The northern branch, Surma, flows west and then south-west to Sylhet town. Beyond there, it flows north-west and west to Sunamganj town, from where it maintains a course south-west and then south to Madna, where it meets the Kushiara branch. It receives several rivers and streams from the Meghalaya Plateau from the north. From east to west they are the Lubha, Hari (Kushia) Goyain Gong (Chengar Khal), Piyain, Bogapani, Jadukata, Someshori, and Kangsha. The flood period is generally from the last week of May to the middle of October, the mean discharge in this period being about 30,000 cusecs. Between 1950 and 1958 the maximum and minimum discharge recorded were 53,008 cusecs (15th August, 1958) and 487 cusecs (21st March, 1954) (WSP 10).31 The Surma bifurcates south of Mohanganj, soon after it receives the Kangsha and, further south, the Mogra. The western

4 Haroun Er Rashid, 1977, opcit.
channel is known as Dhanu in its upper course, Boulai in the middle and Ghorautra lower down. It joins the Meghna near Kuliarchar. The southern branch of the Barak, the Kushiara, receives the Manu with flood discharge of about 15,000 cusecs (WSP 31), north of Moulvi Bazar Town and bifurcates into a northern channel, the Bibiyana, and a southern one, which resumes the name of the original river, the Barak. The Bibiyana changes its name to Kalni, lower down its course and joins the Surma at Ajmiriganj. The Barak (western) receives the Gopla and Khowai from the Tripura hills, and falls into the Surma at Madna. The Surma, from Ajmiriganj downstream, is often referred to as the Meghna. The matter would be simple but for the fact that from Madna downstream for about 16 miles (in a straight line) one of the two channels of the Surma-Meghna is known as the Dholeshori. Unfortunately this northern Dholeshori has the habit of changing sides, so that east of Oshtogram it is east of Surma-Meghna channel, but west of that place it is west of that channel. The switch takes place south of Oshtogram, where both channels meet and is known as the Dholeshori. To avoid confusion the main channel from Ajmiriganj down to the confluence with the Dhamu-Ghorautra will be referred to as Surma. This confluence is three miles east of Kuliarchar. Downstream from there, the river will be referred to as Meghna. Most of the Surma system falls in the Haor Basin, where the line of drainage is not clear and well defined. In the Piedmont tract from Durgapur to Jaintiapur, most of the network of streams and channels overflow in the rainy season and create vast sheets of water which connect the Haors with the rivers. In the Haor Basin, too, the rivers overflow and fill the Haors in the early part of the rainy season, and receive back much of the water soon as the monsoon rains slacken.

The Meghna has two distinct parts. The upper Meghna from Kuliarchar to Shaitnol is a comparatively small river. The lower Meghna, below Shaitnol is one of the largest rivers in the world, because it is the mouth of the Ganges and Brahmaputra rivers. The lower Meghna is here treated as a separate river. The Meghna receives the old Brahmaputra on its right bank at Bhairab Bazar. A little above the confluence the Meghna has a railway bridge over it. The width of the river there is half a mile. The mean discharge at that point, from late May to mid-October, is about 250,000 cusecs with a recorded maximum of 431,500 cusecs in 1960 (WSP 7). Average annual discharge is estimated to be 92 million acre-feet. Several small channels separate from the Meghna and meandering through the lowland bordering the Tippera Surface, receive the flow of a number of hill streams and re-join the main river downstream. The most meandering through two long-S bends, extending over 150 miles, re-joins the Meghna through two channels, in Nabinagar Thana. It receives the Howrah hill stream near Akhaura. Brabmanbaria and Akhaura are both on the banks of this river. Other offshoots of the Meghna are
Pagli, Katalia, Dhonagoda, Matlab and Udhamdi. The Meghna and these offshoots receive the waters of a number of hillstreams from the Tripura hills. The important hill streams are the Gumti, Howrah, Kagni, Senai Buri, Hari Mangal, Kakri, Pagli, Kurulia, Balujuri, Sonaichari, Handachora, Jangalia and Durduria. All of these are liable to flash floods. The Gumti, Kakri and Howrah are the main culprits. They have silted their beds to the extent that they now flow above the mean level of the land when brimful. Embankments have been built to contain them. Most of these are looked after by the farmers and are, therefore, not sufficiently strong. Every other year one or the other of these streams overflow and cause considerable damage to crops, live-stock and houses. The Meghna receives the Tippera Surface streams from the east, and the enlarged Dholeshori from the west. At the confluence, just north of Shaitnol, the Meghna is three miles broad. The Dholeshwori comes down in a brown stream and the Meghna is a clear blue green. For many miles the waters do not seem to mix, for half the river remains brown and the other half is blue green. The boatmen are fond of pointing out this peculiarity. Ten miles from Shaitnol the combined Ganges and Brahmaputra-Jamuna, as the Podda (Padma) river, meets the Meghna in a large confluence seven miles wide in the rainy season. From this point southwards the Meghna becomes one of the largest rivers in the world.

**Gumti**

The Gumti falls into the Meghna at Daudkandi. Its flow varies from 100 to 20,000 cusecs at Coinilfa. Another tributary from the Tippera surface is the Dakatia. The main source of this river was the Kakri, but the Little Feni cut back and captured this upper portion. The Dakatia now has its source in the Chaudagram Khal (canal), which connects it with the Little Feni. The Dakatia sends out a channel southwards, which forms the Noakhali (new canal) Khal. The main channel, meanders westward to Shekherhat, from where the old course goes south to join the Meghna at Raipur, and the new and more strong channel passes through the Chandpur Khal to join west of Chandpur town. For three-fourths of the year the Dakatia is fed by tidal currents from the Meghna. The Little Feni follows a very tortuous course south-wards, and falls into Meghna estuary, south-east of companyganj and a few miles from the Big Feni estuary. The Little Feni is a tidal river; in the rainy season its flow is around 15,000 cusecs; at flow tide there is a reversal of flow of the same volume (WSP 25).  

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34 Tidal Discharge and Water levels of little Feni river at Kazirhat, September-October, 1960, Water Supply Paper 25; EPWAPDA, Hy. Div., Dacca

33
The Tippera Surface show a well marked rectangular drainage pattern. Its cause has been ascribed to the excavation of ditches for earth to build dikes (Morgan and McIntyre 1959). This is only part of the reason. To drain off surplus rain water and to avoid the tight meanders of the hill streams as water-ways, large numbers of canals have been dug in this region. Some of them are very ancient in origin. These canals are sufficiently numerous to give a rectangular pattern to the drainage system. Among the most important of them are Chandpur, Trimani, Chaudgrarn, Bijaipur and Gokarna Khals. All these canals are joined to the channels, which drain off the surplus water of the tanks, which are numerous here.

Ganges

The Ganges, the most sacred of all river to the Hindus rises west of the Nanda Devi Range, and quite close to the sources of the Indus and the Tsangpo (Brahmaputra). It has a length of 1370 miles up to Goalundo, and 1570 miles to the mouth of the Meghna, and a drainage area of 377, 400 sq.miles up to Goalundo. Its average discharge in winter it 80,000 cusecs and in the rainy season 640,800 cusecs. The average annual discharge at Pakshi Bridge (1934-62) is 410,000 cusecs, as compared to 678,000 cusecs of the Brahmaputra at Bahadurabad (1956-62). Total flow per year is estimated to be 294 million acre-feet (Table 1). In the middle Ganges valley, nine large tributaries join it. From Patna down-stream it is as large as when it first forms the border of Bangladesh at Shibganj. Just west of that place it sends south its first distributary, the Bhagirathi, which becomes the Hoogly further down. Just west of Godagari town the Mahanada, a large river in the rainy season, falls into the Ganges. The Baral, a left bank distributary, takes off at Charghat while the Bhairab and Mathabhanga, takes off from the right bank, south east of that place. The baral joins the Atrai-Gumani system. The Jalangi channel of the Bhairab and Bhagirathi- Hoogly are entirely in the Western region. (Fig 1-12)

Bhairab

The Bhairab is an important river in the moribund of the delta. Its name “the terrible”, attests to the size it had reached when the main volume of the Ganges was carried by it. At present the main stream is not navigable beyond Bagerpara Thana. It has two main branches, the Khulna-Icchamati and the Kobadak. The Khulna-Icchamati has parts of its course in India and part in Khulna District. It is the boundary between the two countries. Down to Kaliganj. It is Kalindi till Kaikhali, from which place it is the large estuarine river, the raimangal, which splits up into two, the western named the Hariabhanga and the eastern retaining the original name. Down to

Shifts in the course of the river Ganges.

*Bangladesh Times*, 30 December 1985. - *Source*
Kaikhali, the river will be referred to as Khulna Ichhamati, while south of it is the Raimangal-Hariabhanga.

**Kobadak**

The Kobadak, a correction of the Kapotaksha (the pigeon-eyed), flows south to the forest outpost of Kobadak at the edge of the Sunderbans and there joins the Dholpetua to form the large estuarine river, the Arpangasia. The Bhairab flows south, south-east, to Khulna town where it joins the Khulna-Atrai and becomes the Rupsha. Just south of the town the Rupsha branches into two, the eastern one of which resumes the name Bhairab and flowing southwards loses itself in the estuarine rivers, Keora and Bhoa.

Between the mathabhanga (the broken head) and the Gorai, a large right bank Ganges distributary taking off near Kushtia town, there are large number of rivers and Khals (canals). The Mathabhanga splits up into four main channels, the churni, chitra, Nabaganga, and Kumar, within Kushtia subdivision. The Churni joins the Bhairab, and is an important source of its Khulna-Ichhamati branch. The Chitra flows south-south-east to Uzirhat, where it divides into two branches, the Khulna-Atrai and the Chitra: the former joins the Bhairab north of Khulna town, while the latter joins it to the south. The Nabagonga (New Ganges) is another decayed channel, navigable part of the year and only up to Magura. The lower portion is, however, taking increasing amount of the Gorai's flow into the Pussur river. The Kumar, also called Pangasi, branches from the Mathabhanga ten miles from Alamdanga town and flows in a south-easterly direction to a point five miles north of Magura town, where it divides into two channels, one of which falls into the Gorai, while the other joins the Nabagonga through the Muchikhali at that town. The lower Nabagonga Channel takes much of the Gorai's flow into the Pussur river.

**Gorai**

The Gorai is formed of three large offshoots of the Ganges just north of Kushtia Town. South of Kushtia its first offshoot the Kaliganga, branches off to join the Kumar near Sailkopa. This river has been completely dammed by one of the primary canals of the Ganges-Kobadak project and the lower half of the course is now almost a dry bed. The main river bifurcates and rejoins several times as it flows south-east to Muhammadpur Thana, from there flowing south-south-west. It changes its name to Madhumati. The Kumar, Nabagonga, and Chitra join it through several channels south of Mollahat Thana. Then the name changes to Baleshor (the 'Young Lord') which in turn changes to Haringhata (the 'Deer Ford') from the Bogi forest outpost of the Sunderbans. The Gorai-Madhumati has a flood discharge of nearly 250,000 cusecs, but in winter its flow has gone as low as 5 cusecs (WSP 64). All the rivers between the Khulna Achhaiuati, Ganges, Gorai Madhumati and the sea are connected by cross-channels, which are especially
numerous in the Sunderbans. They are of great importance to inland navigation in the delta, for though the rivers flow in a north-south direction, the traffic is mainly east to west.

Between the Raimangal and Kobadak rivers are the Khulna-Jamuna, Galghashia and Dholpetua rivers. The Galghashia joins the Dholpetua, which joins the Kobadak to form the Arpangasia. This river divides into three. The western most, Araibaki is joined by the Firingi cross-channel from the Jamuna and, as the Malancha, flows into the estuary of that name. The eastern-most, the Hal, joins the main stream to form the large Bara Panga, which widens out into the estuary, after the much smaller Malancha, which also flows into it.

Cross-channels such as the Sakbaria, Bajbata and Koyra connect the Kobadak-Arpangasia with the Shibsha. This latter river is formed of the Balta, Ghansrail, Bhadra, Deluti, Menus Badurgachha and Dhaki rivers, which drain the Boyra swamps and bring some the Pussure's flow. The Shibsha joins Pussur near the sea to form the Morzal river, which flows into the Marjata Estuary. A branch of the Shibsha, the Hansraj-Kaga, bifurcates from that river and also joins the Morzal.

**Pussur-Rupsa**

The Pussur is the continuation of the Rupsha, which as mentioned earlier, is formed of the union of the Bhairab and the Atrai. At present much of its water is from the Gorai, diverted through the Nabaganga. From near Baitaghata the Rupsha changes its name to Kazibacha, which is given up near Chalna for the name Pussur (also called Pasur or Pushur). Near the Mangla anchorage, the Pussur receives the Mangla River, and near the forest outpost at Chandpai it receives the Mrgamari cross-channel from the Bhola, both on the left bank. On the right bank the Manki, Dhaki and Bhodra connect it with the Shibsha System. In the lower delta, the Pussur is second only to the Meghna in size. Formerly it was third after the Madhumati, but with the considerable diversion of the Gorai flow through the Nabagonga, it is now bigger than that river. From its junction with the Mangla, it is nowhere less than a mile wide. Twenty miles from the open sea, it joins the Shibsha to form the three-to-five miles wide Morzal river, which empties into the Bay by the Marjata and the Pussur estuaries.

The land in-between the Pussur and Bhola is drained by the Sela which is wholly within the Sunderbans. Many cross-channels connect it with the systems on either side. A large crosschannel connects with the Morzal, at the head of its estuary, which is the Bangara. East of the Sela, the next big river is Bhola, which begins as a small channel where the Bhairab becomes the Keora tributary of the Baleshor. The Bhola falls into the Haringhata estuary of the Baleshor. The Baleshor, which is the continuation of the Gorai-Madhumati has played a very important role in building up the Mature Delta. The rich Bagherhat and Pirojpur Sub-Divisions depend upon it.
for the annual deposit of silt. Formerly the flood waters kept the sea-water from reaching beyond Bogi at the edge of the Sunderbans but with the diversion of the Gorai into the Pussur, the river is decaying. The flow was sufficient to make the forests of freshwater nature to within ten miles of the sea. At the point of its junction with the Bhola it widens out to four miles to form one of the sources of the huge Haringhata estuary, which also receives the flows of the Bishkhali and the Burishor, and so reaches a maximum width of twelve miles.

Podda

The Gorai-Madhumati-Baleshowar is the eastern-most distributary of the Ganges proper, which does not throw out any more major offshoots down to its confluence with Brahmaputra-Jamuna at Goalundo. From Goalundo downstream the combined Jamuna and Ganges forms the Podda. This name (Podda or Padma) is applied to the Ganges as far up as the point at which the Rhagirathi leaves the left bank, according to the Hindus, takes the sanctity of the Ganges with itself. It is hydrographically more correct to call the river Ganges down to its confluence with the Jamuna. The Podda is sometimes referred to as the Ganges but this is incorrect, not only because this channel was opened out due to the diverted flow of the Brahmaputra, but also because for most of the year, the Brahmaputra-Jamuna contributes more to the flow of the Podda than the Ganges. The river between Aricha and Sureshwor is therefore, best called the Podda for it has every right to be regarded as a separate river. The Podda is seventy-five miles long and from 2-1/2 to 3-1/2 mile wide. The very important Goalundo-Chandpur steamer route is mostly on this river. Near Tepakhola nine miles from Goalundo, the small Faridpur Khal distributary takes off from the right bank. Thirty-one miles further down the Arial Khan river also takes off from the right bank. Nine miles further downstream the Lohajung Khal falls in at Lohajung on the left bank, and the Kristanagar river branches off from the opposite side. A few miles below that place, the Shosha Khal and Naria Khal, take off from the right bank, join up and as one stream fall into the Arial Khan south of Madaripur. The Podda joins the Meghna three miles from Sureshwor in a maze of shifting shoals and Chars. The Lower Meghna is actually a continuation of the Podda.

Arial Khan and the Rivers of Barisal-Patuakhali

The Faridpur Khal joins the Kumar, which meanders across the north of Faridpur District and fall into the Arial Khan at Shibechar. The Arial Khan was, in the second half of the nineteenth century one of the main outlets of the Podda. It has silted up at its head. It bifurcates below Madaripur, but receives back its offshoot, the Turki, below Gaumnadi, and reinforced by the large Safipur offshoot of the Meghna near Muladi, joins that river as a large stream seven miles north-east of Barisal town. The lower Arial Khan and the Madhumati are two of the three main sources for the large network of rivers and Khals in Barisal. The third source is the Bil area of the
Central Delta. The Darika Don and the Shworupkathi and Kaliganj rivers join the Arial Khan and the Madhumati across the north of Barisal District. The Baldia and Uzirpur Khals drain some of the Bils into them. The Kaliganj and Shworupkathi join and fall into the Baleshwor as the Kacha. The Barisal river takes off from the Arial Khan north of Barisal town and meanders towards the south-west. It receives the Kalijira river, Gobkhan Khal and the Rajapur Don on the right bank, and sends out the Bukhinagar Don and the Bakerganj and Pandab rivets from the left bank. From Betagi the name of the Barisal river changes to the Bishkhali, which falls into the Haringhata estuary. On most maps the Paira river is marked as Buriswar. The main offshoots of the Bakerganj river are the Boga Don (a cross-channel with the Ilsa branch of the Meghna), the Patuakhali river and the Kukua Bharani. The Patuakhali (also known as Galachipa Khal) joins the Rabnabad channel (more commonly known as the Agunmukha-'The mouth of fire'). The southern-most part of Patuakhali District (Amtoli and Kalapara Thanas) is cut up by many cross-channels between the Paira and the Agunmukha. The Andharmanik river is the main channel in that network. There are many tidally flushed streams carrying surface drainage, known as Dona.

**Lower Meghna**

The Lower Meghna, the largest river in Bangladesh, is the joint stream of the Podda and the Meghna, reinforced by the Dholeswori. All the three rivers are large. The Dholeshori, Meghna and the Podda are each three miles wide at the confluence. The Lower Meghna has several Chars in it, which create two main channels of which the larger eastern one is three to five miles wide. The western channel is only about a mile in width. Near Muladi the mile-wide Safipur river is an offshoot from the right bank. Further south the Lower Meghna divides into three channels, which are, west to east, the Ilsa (or Tetulia), Shahbazpur and Bamni. The Ilsa is the three-to-four-miles wide channel, separating Bhola island from the Barisal mainland. On the western side of the mouth of the Ilsa are the Rabnabad islands. The shahbazpur channel, three to-five miles wide, separates Bhola from Ramgati and Hatia islands. At its mouth are the Manpura islands. The Bamni can now be said not to exist. It formerly flowed between the islands of Ramgati and Char Lakkhi and the Noakhali mainland, and was at times the main outlet for the Meghna. The tides and their bores always affected it considerably, and this channel dwindled or widened in an unpredictable manner. The estuary of the Lower Meghna is usually taken to stretch from the Rabnabad islands to the Kumira coast, a distance of 95 miles. The water is, however, saline for half the year as far north as a line drawn from the middle of Bhola to the north of Shondip. The estuary of the Lower Meghna may be considered to be the Ilsa and Shahbazpur rivers, which together have a width of twenty miles at the sea-face. The estuarine discharge is not known, but at Chandpur the mean discharge from June to October is around 2.5 million cusecs. The mean
maximum in this period of the year is about 4 million cusecs. In winter the flow is about one-eighth as much, but the river is even then several miles wide; the low cusec figure is due to the sluggishness of the flow. In maximum flood the Lower Meghna's flow is no less than five million cusecs. It is also estimated that from May to October, its daily load of sediments is nearly four million tons. The annual load of sediments carried by it is about 1,500 million tons and annual water discharge about 875 million acre feet. In comparison the Congo, La Plata and the Yangtse have total annual flows of 1,022, 636 and 599, MAP respectively. The Lower Meghna, therefore, as the major outlet of the combined Ganges and Brahmaputra, has somewhat less outflow than the Congo, which is second only to the Amazon. The total discharge of all the rivers in the Peoples' Republic of Bangladesh is estimated to be seven million cusecs in the rainy season, and amounting to about 914 million acre-feet annually (IDA 1972).  

CHITTAGONG REGION

The rivers of the Chittagong Region remain to be considered. They are swifter than those of the other parts of Bangladesh, being for most of their course mountain streams. Large numbers of hill torrents can increase their flow suddenly after a good thunderstorm, which often leads to flash floods.

Karnafuli

The Karnafuli ('flower of the ear') rises in the higher Arakan Yomas and cutting across the main ranges of the Hill Tracts falls into the sea a few miles from Chittagong city. It is known as the Kynsa Khyong to the Marma. There were rapids at Demagiri (in India) and Barkal (these have now been submerged by the Kaptai lake) and gorges at Chilerdak where it cuts through the Subalong Range, and at Silchari where it cuts through the Sitapahar Range. The Jamaimoroni Peak, place of one of the Hill Tracts most popular legends, is besides this latter gorge. The main tributaries of the Karnafuli are Thega, Subalong, Rinkeong, Kaptai and Ichhamati on the left side and Sajjak, Horina, Kasalong. Chengi and Halda on the right. Dhurung and Sarta are tributaries of the Halda, a river as prone to over flooding as the Gunti. The Karnafuli falls into the sea after executing a large S-bend along the Chittagong harbor.

Sangu

The Sangu or Shonkhaw rises in the Sangu Reserve Forest in the south-east of the Hill Tracts. It flows north-west for most of its course and falls into the sea just ten miles front the mouth of the Karnafuli. The Marma call its upper course Sabok Kbyong and its middle course Rigre Khyong. In its upper course there are two small waterfalls and several rapids. Dolu, Hungor and Tankawati are its main tributaries. Its estimated annual flow is 4-1/2 million acre-feet.

37 ibid
Matamori

South of the Sangu is the Matamori (Matamuhuri), or Moree Khyong, as it is known to the Marma. It is shallow and navigable by shallow boats only, for most of its course. Small motor boats can ascend as far as Alikadam 40 miles from Chiringa, in the rainy season. In its lower reaches, it fans out into the fairy big Chakaria Delta. Its estimated annual flow is 3 million acre-feet. South of this river the main ones are the Bagkhali, Rejukhal and Naaf. The first two are very small. The Naaf has a short mountaneous course before falling into the 35 miles long and 2 miles broad Naaf estuary.

'Lakes, Bils, Baors and Roars

In between the rivers and canals there are a large number of water bodies, mostly connected to them by numerous channels. Of lakes, strictly speaking, there are only three, the Rinkhyongkine, Bogakine and the Ahshula Bil. The Rinkhyongkine is on the watershed of the Rinkhyong river in south-east Hill Tracts District. It is a mile long and a quarter of a mile broad and well stocked with fish. The Bogakine is west of Keokradang Peak, at a height of 1,222 feet. It is parallelogram in shape and quite deep. There used to be no fish in its waters till someone released a few Magur (cat fish), and it is reported that they have multiplied exceedingly. This lake is venerated by the local Kilumi tribesmen. The Ahshula Bil, though so is more properly a lake, or Rawd, as they are called in Bengali. It is at the northern end of the Eastern Barind. The Kaptai Reservoir may be counted as the fourth.

Bils, as has been said previously, are usually saucer like depressions, of a marshy character. In the rainy season they are full of water and resemble lakes. At other seasons the water-level goes down and sedges make them look like marshes. Some Bils dry up completely and are cultivated. A few on the other hand look like lakes throughout the year. They are all fed by surface run-off and by small channels that connect them with the rivers. The former source is the more important. There are far more Bils probably over a thousand than can be described adequately; the important ones may here be mentioned. In the Northern Region there are a large number of Bils—a legacy of the much-changed river system. There are no big ones in Dinajpur District; Rangpur District has three Tagrai west of Kurigram Town, Lunipukur west of Rangpur Town and Bara Bil in Pirganj Thana. In Bogra District there are two large Bils, just to the east of the Bogra Karatoya, the Nurail and the Keshpathar. Further east, in Shariakandi Thana are Sat and Gobarchapa Bus. In the south-west is the Raktadaha Bil, connected with the Parul in Raishahi District. Along the Mahananda river are several Bils of which Baitia in Bholahat Thana is the largest. In the west-central Barind the main Bils are Boro Mirzapur in Porsha Thana (probably in a block fault) and Paticola in Godagari Thana. Along the eastern edge of the west-central part of
the Barind are a number of Bils, probably marking an old course of the Atrai river. From north to south the big Bils in this line are Chakchaki, Sabul, Ghungri, Kanchon, Manda, Utrail, Siddheswor, Ghona, Hilna, Kumar, Shona and Bagsimli. Between these Bils and the chalan Bil System are a number of others, such as Ajum, Malshi, Angra, Podda, Shewti, Gondi Parul and Shonaikanda.

The Chalan Beel System is large; it consists of all those Beels which join through various channels, to form more or less, one continuous sheet of water in the rainy season. They are, from west to east, Purba Madhnagar, Piprul, Dangapara, Laror, Tajpur, Niala, Chalan, Majhgaon; Briasho, Choumohon, Satal, Khardaha, Darikushi, Kajipara, Gajna Bara, Sonapatila, Ghugudaha, Kuralia, Chiral, Dikshi and Gurka. These Bils are the lower spots in the low-lying Bhar area, most of which is inundated in the rainy season. The Chalan Bil was formed when the Jamuna branch of the Brahmaputra expanded and dammed back the Ganges, causing the latter to deposit sediments at the mouths of the Karatoya end Atrai, which then flowed into the Ganges. It was probably a back swamp before it was greatly expanded by the pent up flow of the Atrai and Karatoya, and became a lake of some 420 sqmiles. With the gradual silting up of its southern side by the annual deposits of the Ganges it has moved twelve miles inland in the last century and a half. By 1909 the area of the Bil is said to have been reduced to 142 sq. miles of which only 33 sq. miles were under water throughout the year (O'Malley 1923). It was then estimated that 222.5 million cubic feet of silt was brought into it by feeder rivers, of which 53 million cubic feet were carried by those draining it. The remaining 169.5 million cubic feet were deposited, which if distributed equally would raise the level, of the Bils half an inch a year. In 1913, however, it was found that the perennial water body was less than half of what it was four years back. In the 1950s various reclamation works have reduced the Bil to about ten sq. miles. In the South Bengal there are even more Bils than in North Bengal and also a number of Baors. These latter are cut of arms of decayed river channels, principally of the oxbow type. All the Baors are in the Moribund Delta. They are more stagnant than the Bils and generally have water throughout the year. The principal Baors are Sagarkhali, Jaleshwor, Bokor, Thampar, Khedapara, Ranipur, Pathanpara, Katagar, Jogini, Bhogini, Ichhamati, Baluherer, Joydia, Marjat, Bukbhona, Harina, and Arol. They range in size from a quarter of a mile to five sqmiles. The larger Bils in this area are Kamladaha, Chakli, Taleria, Jhanja, Bo alia, Malar and Jaleshwor. The line of Bils across the north of Khulna District and into the Central Delta Basin contain the flowing large ones from west to east, Dantbhanga, Boyra, Shahapur, Dakatia, Pabla. Bakar, Boro, Kolo, Patla, Baranal and Srirampur. They cover parts of Satkhira, Asasauni, Dabhata, Kaliganh, Tala, 41
Dumuia, Daulatpur, Terokheda, Mollahat and Bagherhat Thanas. The main Bils in the Central Delta Basin are Katli, Nalua, Chatal, Moura, Nagarkanda, Kazudanga, Baghila, Atadanga, Chanda, Pathram (two of them), Ujan, Digra, Ishwordi, Rathnoranga, Harhora, Ghazoria, Soladanga, Patnidanga, Kasmira, Pabnia, Gopalpur, Bashor, Kajalia, Ramshil dighi, Boghia, Janihjauia, Tungi, Donura, Deulbari, Poddo, Dumaria, Satin, Ashkar, Suga, Baldia and Harta. Of these, Katli, Nalita, Kasmira, Pabania, Soladanga and both Pathrams dry in March and April, before they begin to fill up again from May onwards. The other Bils have some waterfall year round.

Over most of Central Bengal Bils are comparatively few. There are many small basins in the Recent and the Pleistocene deposits, but they are slight depressions. Outside the Haor Basin the large Bils are Arial, Belai and Howda. Arial bil is a dominant feature in the Kaliganga-Podda interfluve. Belai is in the southern part of the Madhupur Tract, and Howrah is in the northern part. In the Haor Basin there are no less than 400 Haors and Bils. The majority of these are, however, small appendages of the larger. In the deep center the main water bodies are Baram–Banka–Habibpur–Maka–Makalkandi (All those joined together in the rainy season are hyphenated water bodies) and Glulduba Haors and the Panga and Bandha Bils. In the deep basin at the foot of the Meghalaya Plateau are the large Tanguasamir and Matian Haon. Close to the east are the Dakhar, Jhilkar–Jhinkar and Patharchauli Haors. In the eastern part of the Haor Basin Rim are the Jamaikata, Mahai-Nalua-Parua Haors; Between the Tarpa (Satgaon and Bhanugach ranges there is the large Hail Haor. In the Central Sylhet Iowland there are a number of Haors such as the Hakaluki group of Haors and Bils and the Chatal, Bar and Hailka Haors. There are seasonal Bils, with water only in the rainy seasons, all along the foot of the Meghalaya Plateau. In the south of the Basin the major Haors are Dingapata, Ganesher, Talar, Anganer, Bara and Humaipur.

South of the Haor Basin, on the Tippera Surface plain and the Titas plain there are a number of comparatively small Bils, of which the major ones are Buroli, Hatia, Kahla, Fada, Horkhai, Gogra, Sandipa, Bayeshakaha, Shafla, Belanga, Shalizadpur, Hugli, Langula and Satbaria.

In the Chittagong Region Bils are even fewer; they are small and usually contain water only in the rainy season. There are, however, big marshes, overgrown with large grasses and reeds, along many of the rivers of the Hill Tracts. The large of these marshes is along the lower course of the Sajjak river.

38 ibid
WATER-TABLE

The water table is generally high, because of the soil and topography, over most of the country. The highest level varies from two to six feet below the surface in the delta areas in the rainy months of fifty feet or more below in the Barind in the dry months. Over the greater part of the country, however; the water table is between four and ten feet.

The water table is as high as six feet or less in large parts of the country; but good aquifers are found mainly between 60 and 150 feet. In the Barind and Madhupur Tracts and the Chittagong Region good aquifers are often lower. In the coastal belt, aquifers with potable water are usually at depths below 350 ft. and often as low as 900 feet. The natural fluctuation of the water table varies from five to over twenty-five feet.

Ganges- Brahmaputra- Meghna Basin

Hence it can be said that most of the Bangladesh is located within the flood plains of the three great rivers—the Ganges, the Brahmaputra and the Meghna along with their tributaries and distributaries. The three rivers drain a total catchment area of about 1.72 million of which only 7% lies within Bangladesh. The remaining area lies in India, Nepal, China and Bhutan. Out of this 57 are transboundary rivers. Hence it is necessary to treat the entire river basin as one for developing the huge unutilized potential and the needs of each country to be assessed in terms of their demands. Although technological activities for water resource development have been undertaken in the past, the region still provides for the development of the huge unutilized potential. The best way would be to have an integrated approach treating the entire river basin as one. This may not be possible from political considerations but at least development planning may be carried out in totality and as well as from each country’s point of view and then a development plan for each country may be developed.

INDO-BANGLA COMMON RIVERS

With approximately 90% of the catchment area of the total river system located outside the country, Bangladesh’s situation with regard to surface water is very vulnerable. Fifty seven rivers are common to India and Bangladesh. These are:

1. Brahmaputra,
2. Dudhkumar,
3. Dharla
4. Teesta
5. Kharkharia-Jamuneshwari
6. Talma
7. Karatoa-Atrai
Figure 1.13: Ganges, Brahmaputra and Meghna river basins

Source: BANCID Seminar on evolution of a scientific system of FF&WC 1997
8. Dahuk
9. Mahananda
10. Nagar
11. Kulik
12. Talong
13. Punarbhava
14. Pagla
15. Ganges
16. Mathabhanga
17. Kobadak
18. Ichamati-Kalindi
19. Raimongal
20. Matamuhuri
21. Rankhiang khal
22. Thegaor Kawrpin
23. Karnafuli
24. Kasalang
25. Myani Khal
26. Halda
27. Feni
28. Muhuri
29. Selonia
30. Little Feni Dakatia
31. Gumti
32. Salda
33. Bijni
34. Howraah
35. Andersan Khal
36. Sonai
37. Sutang
38. Khowai
39. Karangi
40. Lungla
41. Dhalai
Map showing the 57 Indo-Bangladesh common rivers.

Source: BWDB, MPO, 1985
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