Physiography of Bangladesh

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—A Survey—

Bangladesh exhibits a marked parallelism in geologic history and resulting physiograpraphic characteristics. It has been scene of tremendous alluvial deposition since the Mesozoic era. In the Recent epoch alluviation, subsidence, and isotatic uplift have taken place and the rivers have built large flood plains and deltas. Thus Bangladesh has Tertiary hills, Pleistocene terraces, and Recent plains. The purpose of this paper is to descrive the physiographic characteristics of Bangladesh. It is worthwhile to note that Rizvi's works on the related subject is one of the most comprehensive studies and this survey is much obliged to him.

The major part of Bangladesh is an alluvial basin (the Bengal Basin) filled with Quaternary sediments deposited by the Ganges, Brahmaputra, Meghna and other streams. The time from mid-Miobene to the end of the Tertiary was a period of crustal unrest in the Indian subcontinent Major earth movements culminated in uplift of the Himalayan Mountain Range, the faulted and folded hills and plateaus of Assam, and the more gently folded Chittagong Hills of Bangladesh (Wadis, 1953, pp. 304-308).

The Pleistocene epoch is notable for continental ice sheets which extended in the northern hemisphere as far south as 39° N. latitude (Ibid, p. 373). The Bengal Basin lying to the south of this line did not experience glaciation but could not not escape its world-wide effects. During the glacial periods the sea level fell with the advancing continental ice sheets: only to rise again during the interglacial periods. The generally accepted estimate of the drop in sea level during the last glacial age is on the order of 400 feet (Russell, 1957, p. 379). Lowering of sea level increased stream gradients amd caused them to become entrenched. During interglacial stages the glaciers melted and with resulting rise of sea level river gradients decreased and deposition took place in their entrenched valleys. Pleistocene terraces have also been recognized in the Bengal Basin in several areas. Factual data about them are inadequate, however, and do not conclusively prove the existence of multiple terraces

(Morgan and McIntire, 1956, p. 38).

Bangladesh can be divided into three major physiographic units; Tertiary Hillis, Pleistocene Terraces, and Recent Plains (Fig. 2). These can be further subdivided into specific areas:

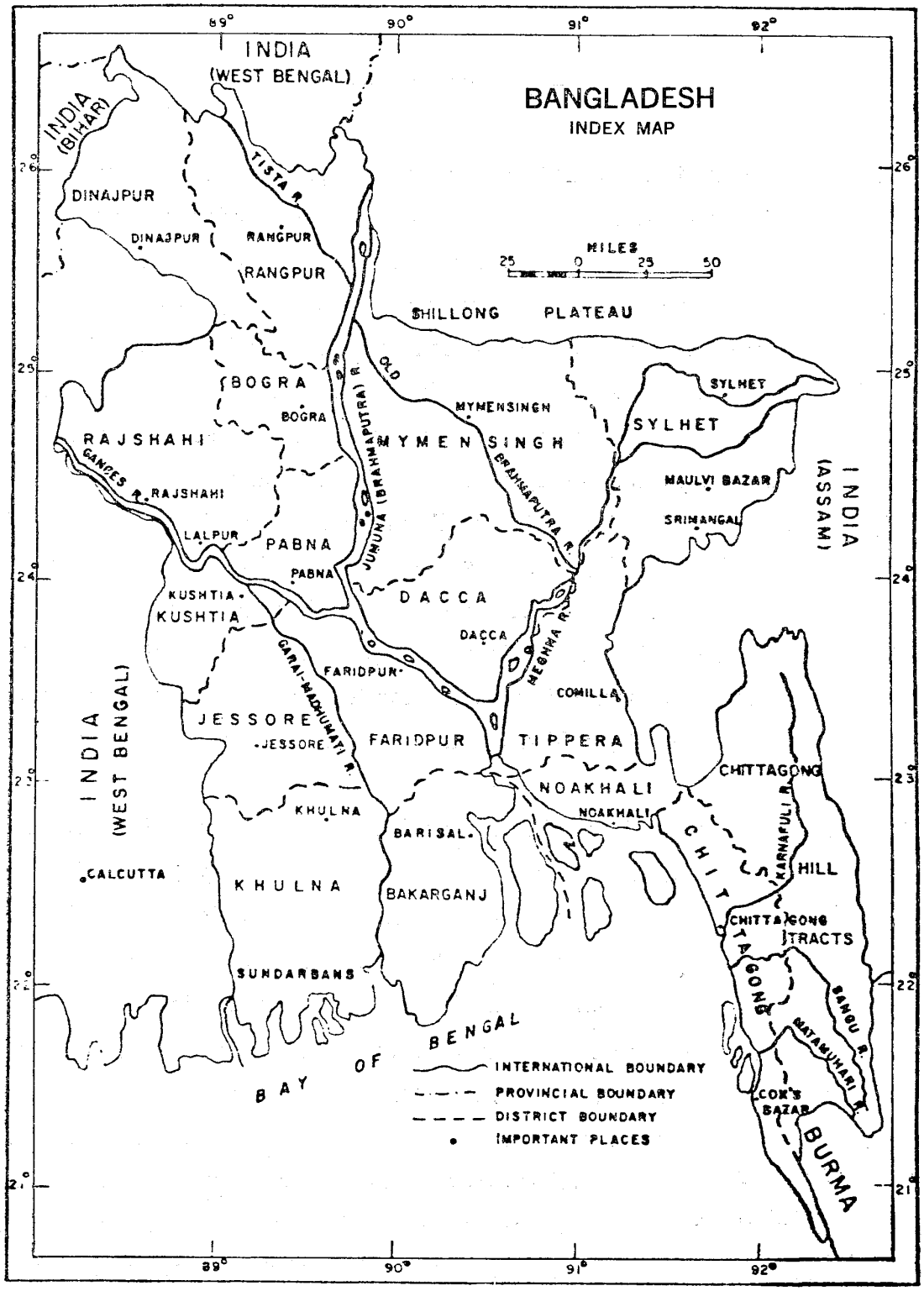
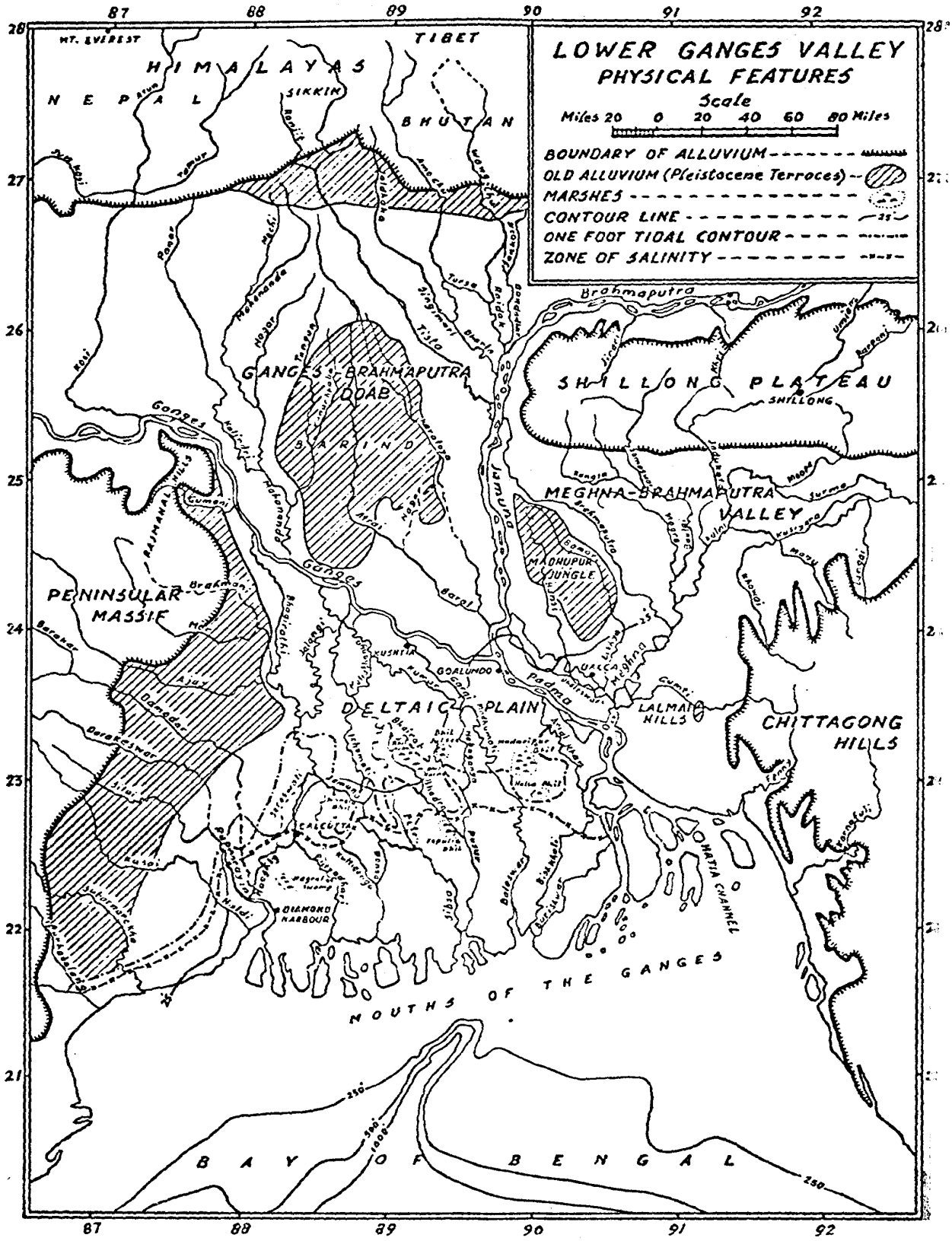


Fig. 1



(After RIZVI).

Fig. 2

1 Tertiary Hills
- (a) Chittagong Hills
- (b) Tripura Hills

2 Pleistocene Terraces
- (a) Barind
- (b) Madhupur Jungle
- (c) Minor Terraces

3 Recent Plains
- (a) Tippera Surface
- (b) Piedmont Alluvial Plain
- (c) Ganges-Brahmaputra-Meghna Flood Plain
- (d) Deltaic Plain (including the Tidal Plain)
- (e) Chittagong Coastal Plain

1. Tertiary Hills

The Tertiary Hills of Bangladesh are a continuation of the Assam Hills and the Burmese arc. Political boundaries have divided the hills among three countries, Burma, India, and Bangladesh. Hills within Bangladesh occur in the northeastern and southeastern part of the country.

1-a Chittagong Hills

The Chittagong Hills occupy the District of Chittagong Hill Tracts and parts of Chittagong District. This is the only extensive hill area in Bangladesh. They rise from 200 to 3,000 feet within a distance of forty-five miles from west to east. The steep gradient coupled with over 100 inches of rainfall, annually, falling mostly within four months, deeply entrenched the streams draining the hill slopes. Principal drainage follows synclinal valleys paralleling the hill ranges for considerable distance before finding their way west into the Bay of Bengal. The jagged hills are unfit for cultivation and it is only in narrow stream valleys that agriculture is possible. Some parts of the hill slopes are, however, used for growing crops by the primitive tribes living in the area who practice shifting cultivativation, locally called 'jhuming'. The major parts of Bangladesh's hills are clothed with forests.

1-b Tripura Hills

Only a few northern spurs of the Tripura Hills are in Bangladesh so they do not form a continuous chain. They are represented by a series of isolated and elongated hills occupying the southern part of Sylhet District (Fig. 1). Although the hills are too rugged for extensive farming, the area is suitable for cultivation. The majority of Bangladesh's tea plantations are located in this region.

2. Pleistoccne Terraces

Pleistocene terraces of Bangladesh generally stand above the monsoonal flood level and are drained by relatively small, entrenched meandering streams. Their higher relief is due not only to the more resistant nature of the materials, but also to the uplift to which they have been subjected (Ibid., pp. 11-15). In Bangladesh there are two large areas of Pleistocene terraces and a number of minor ones.

2-a **Barind**

The Barind is the largest of the Pleistocene terraces in the Bengal Basin, covering an area of about 3,600 square miles (Ibid., p. 19). It has been separated into four units by the Recent flood plains of sevral rivers draining the foothills of the Himalaya. Of these the three eastern units occupy the west-central part of Bangladesh.

The surface of the Barind has a domal appearance and rises twenty to forty feet above the adjacent Rccent flood plains. Small streams, locally called 'kharis', have entrenched meandering courses that are easily distinguished from the sluggish and braiding rivers of the flood plain (Ibid., pp. 19-26).

2-b **Madhupur Jungle**

South of the Old Brahmaputra River is the Madhupur Jungle. It covers an area of about 1,585 square miles and is the second largest Pleistocene terrace in Bangladesh. The Madhupur Jungle has an elevation of twenty feet on its eastern and southern parts and rises to 100 feet on the western side. On the east and south it dips beneath the Recent deposits but on the west toward the Brahmaputra Flood plain it presents a highly dissected steep edge formed by a series of six echelon faults ranging in length from six to thirteen miles (Ibid., p. 27). Streams have thoroughly dissected the Madhupur Jungle and a flat surface is hard to find.

2-c **Minor Terraces**

There are a number of minor Pleistocene terraces in Bangladesh; the Lalmai Hills, a few areas in the southern part of Sylhet District, and Chhatak Hills. The Lalmai Hills cover an area of thirteen square miles in Tippera District west of Comilla. It is an uplifted horst bounded on the east and west sides by faults and

tilted toward the east (Ibid., p. 34). This small unit, formed of silts and sands with underlying layers of gravels and coarser materials, has an average elevation of seventy feet with individual peaks rising over 150 feet. The hills are highly dissected, particularly on the eastern side.

The Sylhet Hills and Chhatak Hills lie in Sylhet District. The former extend northeast from the town of Sylhet and occupy an area of seventy-two square miles. They attain a height of 200 to 300 feet above sca level. The Chhatak Hills occupy a small area of about twenty-five square miles west of Sylhet. Both hill areas have rugged relief, and exhibit a surface thoroughly dissected by steep, narrow stream valleys.

The Barind is by far the most extensive and agriculturally the most important of the Pleistocene terraces. Its slightly dissected and flat-to-rolling surface is suitable for cultivation. The Madhupur Jungle stands next to the Barind in agricultural potentiality. The best agricultural lands of the latter are toward the south where relief is less and river valleys are wider. The minor terrace outliers are rugged, thoroughly dissected, and less important agriculturally. With the exception of tea gardens the hilly areas are primarily forest.

3. Recent Plains

Most of the area of Bangladesh is composed of the deltaic and alluvial plains of the Ganges, Brahmaputra, Meghna, and other less important rivers. The streams are braided and invariably overflow their banks during the summer monsoon. Major changes in stream location, depth and width result from annual floods. Alluvial sediments are distributed over area and levee backslopes are less uniform with flatter gradients in Bangladesh. Lowlands between levee systems are shallow marshlands flooded during the rainy season but may dry up during the winter season. These shallow depressions are locally called "bils". Because of greater inundation, more uniform deposition of sediments and a marked dry season there is practically no backswamp in Bangladesh. Consequently, agriculture can be extended far into the "bils". The combined waters of the Ganges, the Brahmaputra, and the Meghna flow into the Bay of Bengal through a seven-wide estuary. The braiding rivers build numerous sandbars in their channels and river mouths of which some are large enough to be inhabited and cultivated.

3-a **Tippera Surface**

The Tippera surface has low relief land and is inundated during the monsoon flood. It occupies an area of 3,000 square miles and covers most of Tippera District and parts of Noakhali and Sylhet Districts (Fig. 1). It is slightly uplifted and is an older part of the Recent flood plain (Morgan and McIntire, 1956, pp. 39-41). Its average elevation is about nineteen feet above sea level in contrast to fourteen and one-half feet for the adjoining flood plain. The streams have a meandering pattern, rather than the braiding pattern of the streams draining the flood plain to its immediate west. Rivers are slightly entrenched and have formed cut-off and ox-bow lakes. The drainage pattern is rectangular, probably a man-made feature.

3-b **The Piedmont Alluvial Plain**

The Piedmont Alluvial Plain comprises the major part of Dinajpur and Rangpur Districts (Fig. 1). It is drained by the Tista, and other streams which rise in the Himalaya Mountains in the north. Coalescing alluvial fans formed by numerous rivers flowing out of the Himalaya Mountain system have built an extensive piedmont Alluvial plain which overlaps the northern part of the Barind Pleistocene surface. Changing river systems on the plain have contributed greatly to diversity of crops since nothing can be grown in the inundated areas except jute and rice.

3-c **Ganges-Brahmaoutra-Meghna Flood Plains**

Between the Piedmont Alluvial Plain-Shillong Plateau and the northern limits of the Deltaic plain are several flood plains. The largest is in the Sylhet Basin area; the remainder lie along the river systems that extend west of the Madhupur Jungle to the Bangladesh border.

The Sylhet Basin comprises the major part of Sylhet District and adjoining parts of Mymensingh District (Fig. 1). It is a depressed basin and is probably still subsiding. This is suggested by the much lower elevation of the area (ten feet above sea level in its northern part) compared with the adjoining flood plain of the Old Brahmaputra River. The subsidence has been thirty to forty feet within the last few hundred years and is tectonic in origin. It is related to the main fault system along the southern flank of the Shillong Plateau (Ibid., pp. 41-43). The major part of the Sylhet Basin is under water during the rainy season.

Flood plains are important agricultural areas of Bangladesh. River levees are

intensively cultivated and lands that are submerged during flood times are utilized during the dry winters. Parts of the "bil" areas and sand bars are farmed when the rivers are at low stage.

3-d **Deltaic Plain**

The combined Ganges and Brahmaputra Rivers have built the Deltaic Plain which extends south of the Barind surface to the Bay of Bengal. Over two-thirds of its total area lies in Bangladesh. Its southern part is affected by high tides and will be considered separately as Tidal Plain.

Numerous active and inactive distributaries characterize the Deltaic plain. The inactive rivers west of the Garai-Madhumati carry a small amount of the Ganges load during flood time. In the dry season most of them are completely cut off from the parent stream. These rivers have meandering courses and formed ox-bow lakes during their active stages (Bagchi, 1944, pp. 50-56).

East of the Garai-Madhumati lies the active part of the delta which is annually inundated. The Garai-Madhumati became important after the diversion of the Old Brahmaputra to the present Jamuna channel (Fig. 1). The Ganges' water was thus blocked and a considersble portion began to flow through Garai-Madhumati (Majumdar 1942, p. 78).

River levees, "bils" and sandbars are the main physiographic features in the Deltaic Plain. Relatively large but shallow "bils", locally called "jheels" are present in the Khulna, Faridpur and Bakarganj Districts (Rizvi, 1955, p. 207).

Numerous sand bars are present both in the channel and at the mouth of the combined rivers. Some of them have become fairly large in size and have been settled and cultivated.

The coastal area of the Bay of Bengal includes the Tidal Plain. It lies within the southern part of the Khulna and Bakarganj Districts. The major part of the Tidal Plain was formerly covered with mangrove forests. Much forest land has been cleared for agricultural purposes but it still covers an area of 2,316 squares in the southern part of the Khulna District (Government of East Bengal, 1953, p. 26). The sbsence of fresh water streams and salinity conditions caused by tidal invasions and accentuated by cyclonic storms prohibits intensive farming. Settled areas must be diked against high tidal water.

3-e **Chittagong Coastal Plain**

The Chittagong Coast Plain occupies a narrow margin along the sea in Chittagong District. The average width is five to six miles, widening to sixteen miles at the mouth of the Karnafuli River. A narrow strip of coastal marsh has developed and isolated mangrove swamps are present. Inlsnd the usual levee and "bil" topography of the Bangladesh Deltaic Plain is found.

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