Grids & Datums

PEOPLE'S REPUBLIC OF BANGLADESH

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"Historians believe that Bengal, the area comprising present-day Bangladesh and the Indian state of West Bengal, was settled in about 1000 *B.C.* by Dravidian-speaking peoples who were later known as the Bang. The first great indigenous empire to spread over most of present-day India, Pakistan, and Bangladesh was the Mauryan Empire (*circa* 320-180 *B.C.*), whose most famous ruler was Asoka (*circa* 273-232 *B.C.*). Although the empire was well administered and politically integrated, little is known of any reciprocal benefits between it and eastern Bengal. The western part of Bengal, however, achieved some importance during the Mauryan period because vessels sailed from its ports to Sri Lanka and Southeast Asia. The Turkish conquest of the subcontinent was a long, drawn-out process covering several centuries. It began in Afghanistan with the military forays of Mahmud of Ghazni in 1001. By the early thirteenth century, Bengal fell to Turkish armies.

The Indian subcontinent had had indirect relations with Europe by both overland caravans and maritime routes, dating back to the fifth century *B.C.* The lucrative spice trade with India had been mainly in the hands of Arab merchants. By the fifteenth century, European traders had come to believe that the commissions they had to pay the Arabs were prohibitively high and therefore sent out fleets in search of new trade routes to India. The arrival of the Europeans in the last quarter of the fifteenth century marked a great turning point in the history of the subcontinent. The British East India Company, a private company formed in 1600 during the reign of Akbar and operating under a charter granted by Queen Elizabeth I, established a factory on the Hooghly River in Bengal in 1650 and founded the city of Calcutta in 1690. Siraj ud Daulah, governor of Bengal, unwisely provoked a military confrontation with the British at Plassey in 1757. He was defeated by Robert Clive, an adventurous young official of the British East India Company. Clive's victory was consolidated in 1764 at the Battle of Buxar on the Ganges, where he defeated the Mughal emperor. As a result, the British East India Company was granted the title of **diwan** (collector of the revenue) in the areas of Bengal, Bihar, and Orissa, making it the supreme, but not titular, governing power. Henceforth the British would govern Bengal and from there extend their rule to all of India. Pakistan itself had been created on August 15, 1947, largely the result of communal passions pitting Hindus against Muslims. Pakistan was divided into two wings, separated by 1,600 kilometers of Indian Territory, with Islam only a tenuous link between the two wings. Of paramount importance to East Pakistanis was the Bangla (before 1971 usually referred to as Bengali) language and culture, a consideration not appreciated by the West Wing of Pakistan until it was too late. Bangladesh, formerly the East Wing of Pakistan, emerged as an independent nation in December 1971," *(Library of Congress Country Studies).*

Bangladesh is slightly smaller than Wisconsin, and is bordered by Burma (193 km), India (4,053 km), and the Bay of Bengal (580 km). The terrain is mostly flat alluvial plain, and is hilly in the southeast. The lowest point is the Indian Ocean (0 m), and the highest point is Reng Tlang (957 m) *(CIA World Factbook).*

The Survey of Bangladesh is the national surveying and mapping agency for Bangladesh. The department started its functioning as the "Bengal Survey" on the 1st of January, 1767 under the command of Major James Rennell, the First Surveyor General in undivided India. The Bengal Survey conducted survey and mapping activities until 1947. After the partition of the sub-continent on August 14, 1947, the organization started its new role as the Survey of Pakistan and established a regional office at Dhaka. This regional office was transformed into the Survey of Bangladesh when the country immerged as an independent state in 1971. The original "datum" of the Indian subcontinent is commonly referred to as the Indian Datum of 1916 with origin at Kalianpur Hill where: Φ_o = 24° 07' 11.26" N, Λ_o = 77° 39' 17.57" East of Greenwich, and the ellipsoid of reference is the Everest 1830 where: a = 6,377,276.345 m, and $1/f$ = 300.8017. The original topographic mapping of Bangladesh by the Survey of India was based on the Lambert Conical Orthomorphic projection, India Zone IIB where: the central meridian, λ_o = 90° E, the latitude of origin φ_o = 26° N, the scale factor at the latitude of origin m_o = 0.998786408, and False Easting = 3,000,000 Indian Yards, and the False Northing = 1,000,000 Indian Yards. (Note that 1 meter = 1.093619 Indian Yards.)

However, the Survey of Bangladesh considers the national datum to be the Bangladesh Datum with its origin at Gulshan (in metropolitan Dhaka), where: Φ_o = 23° 47' 49.48502" N, Λ_o = 90° 25' 06.55270" East of Greenwich, the ellipsoid height, h_o = +8.53 m, and the ellipsoid of reference remains the Everest 1830. The local Grid coordinates of Gulshan on India Zone IIB *as published by the Survey of Bangladesh (SoB)* are: Easting = X = 3,044,611.838 Indian Yards, Northing = Y = 733,492.5266 Indian Yards. Furthermore, the WGS84 coordinates of Gulshan are published by *SoB* as: φ = 23° 47' 52.02714" N, λ = 90° 24' 56.34024" E, and ellipsoid height = h = –45.4494 m. The SoB has published a 3-parameter transformation **from** the Bangladesh Datum **to** WGS84 Datum, but did not offer an accuracy estimate of the transformation parameters. Thanks to a report, *Compatibility of GPS with Local Grid Co-Ordinate System of Bangladesh,* by LTC. Kazi Shafayetul Haque, Director, Survey of Bangladesh, (probably published around 1998), 11 collocated points were published on both datums. I re-computed the transformation myself, and I verified the test points relation to have virtually the same parameters as LTC Haque to within ±0.43 m. Those published parameters are: ΔX = –283.7 m, ΔY = –735.9 m, and ΔZ = –261.1 m. Considering the size of the area of Bangladesh, the accuracy of a 3-parameter datum shift being within ±0.43 m is really quite excellent!