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QUATERNARY GEOLOGY OF BHOLA DISTRICT, BANGLADESH

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ABSTRACT

Geological investigation of Bhola District has been carried out during 2007-2008 field season under the project 'Geological Exploration for the Identification of Mineral Resources and the Areas Vulnerable to Natural Hazards in the Coastal Parts of Bangladesh'. About 3403 sq. km area has been mapped at a scale 1:250,000. Bhola District is located in the central part of the estuarine coastal plain region of Bangladesh. The study area has been divided into three different physiographic units: (1) Estuarine Floodplain, (2) Estuarine Tidal Plain and (3) Tidal Plain. It has been classified into eight distinct map units: (1) Old Tidal Floodplain Deposit (2) Young Tidal Floodplain Deposit (3) Channel-fill Deposit (4) Natural-levee Deposit (5) Old Tidalplain Deposit (6) Young Tidalplain Deposit (7) Supratidal Deposit and (8) Intertidal Deposit.

On the basis of sedimentological characteristics, depositional environment and facies assemblages Bhola and Monpura Island have been divided into three zones. Dominant litho-facies of Zone-I is fluvial sand. This zone is characterized by the presence of Bhola paleosol which exists at 38-43 meter (m) depth. Zone-II has deposited in a mixed environment where fluvial influence is remarkable. Lalmohan paleosol is present in the southern part of this zone. Zone-III contains predominantly tidal mud facies with alteration of sand and clay deposits. Charfasson paleosol exists at southern part of Lalmohan as well as northern part of Charfasson within 47-58 meter depth. These paleosols are composed of silty clay, olive yellow (2.5Y 6/8) to strong brown (7.5YR 5/6) in colour, mottled, moderately sticky and compact; contain hard and incipient concretions, calcareous nodules, burrows filled with very fine sand, black and hard plant roots. Chemical analysis shows that Base/Alumina, Base/ R_2O_3 and PWI values are (0.319-0.382), (0.260- 0.272) and (1219-1506) respectively. These paleosols contain clay minerals like- chlorite (0-22%), illite (56-65%) and kaolinite (22-35%). On these soil horizons about 1-2 meter thick silty clay to clay bed exists which are bluish gray (5B 5/1) to dark gray (7.5YR N4/) in colour, moderately sticky and slightly compact; contain wood, leaves, decomposed vegetal matter etc.

Geological evaluation of these areas has been studied on the basis of borelog data, drilled maximum upto 90 meter depth. Subsurface data indicate that development of these islands probably was initiated long before the last glacial maxima. With the introduction of the glacial era, the sea level began to fall as a result, tracts of land became exposed leading to the

formation of paleosol horizons. After the last glacial maxima, sea level began to rise as a result marine intrusion took place in this area which is supported by presence of marine pelecypod shell of 11,952 (±40 Ca) Years BP in 40.23 m depth at Char Motahar, Charfasson. Overlying sediments of all the paleosol horizons contain plenty of vegetal matters indicating formation of lands through infilling process of low lying areas, relict river channels, lagoons etc. Occurrence of wood fragment of 9498 (±35 Ca) Years BP in bluish gray clay to silty clay bed below 56.69 meter depth at Uttar Char Mainka indicates that the deposition has been taken place during the Holocene Epoch under slow sea level rising condition. Afterwards, the sea began to rise sharply to establish an estuarine condition in the whole region leading to the backfill deposition remarkably. Frequent repetitions of sand and clay beds in Charfasson and Monpura indicate tidal condition of deposition. Whereas, deposits of Lalmohan and surrounding area, indicate fluvio-tidal condition. But deposits of Burhanuddin and Sadar upazilas are composed of monotonous sand sequence. It may be the result of channel migration and backfill activities.

Storm and tidal surges, water logging, river bank erosion, iron effect, arsenic contamination in ground water, earthquake, cyclone, saltwater problem etc. are the main hazards of the area. The land areas of Bhola are continuously changing due to erosion and accretion of new land. Spatial analysis of different maps and satellite images analysis depicts that from 1977 to 2010; Bhola District had lost about 427.03 square kilometer (sq km) and gained about 558.61 sq km. of land, while accretion was more than erosion.

The area has lack of major surficial economic mineral deposits. Clay deposits found all over the mapped area are now being used as raw materials for brick manufacturing and making pottery on a small scale by the locals. Sands are collected from channel beds and newly formed bars and are now being used as filling materials. The minerals like, Quartz 93.21% and Kyanite 1.39% has been identified in sand samples from 7.5 m depth at PTI, Bhola Sadar and Quartz 93.21%, Ilmenite+Magnetite 0.33%, Garnet 0.28%, Rutile 0.37%, Leucoxene 0.9% and Kyanite1.89% from 3.3 m depth at Sakuchia, Monpura. The following Trace elements: Barium, Chromium, Zirconium, Rubidium, Strontium, Vanadium, Zinc, Niobium, Cesium, Copper, Nickel, Lead, Galena, Arsenic, Molybdenum, Tin and Cadmium have been identified by XRF analysis of seven sediment samples collected from 01-78 meter a depth at different locations. The rare earth elements Cerium, Lanthanum, Scandium and Yttrium and the radioactive elements Uranium and Thorium are also present in all samples. Detail study is suggested to ascertain the amount of these elements in sediment.