

Problems of environmental protection and ecology on Bangladesh

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Abstract—The paper deals with the characteristics of Bangladesh basin including river morphology, rain fall pattern, cyclonic storms, forests and coastal area environment and ecosystem. It deals with factors which contribute to floods both natural and man-induced. The paper does with pollution problems including land and water use and indicates briefly policy measures and strategy adopted by government to combat problems of environment and ecology in Bangladesh.

Keywords: Bangladesh; characteristics; floods; pollution.

CHARACTERISTICS OF BANGLADESH BASIN

Bangladesh with an area of around 144000 km² and with a population of more than 100 million is situated in the north-eastern part or the South-Asian Sub-continent. The country comprises eastern portion of the Ganges-Brahmaputra delta which stretches north ward to the foot hills of Assam. The delta formed by the Ganges, Brahmaputra and Meghna is the largest in the world. These three rivers have huge catchment area of about 1554000 km² spread over five countries namely Bhutan, Nepal, China, India and Bangladesh. The number of rivers, canals and streams in Bangladesh is about 230 with a total length of about 24135 km and occupy a riverain area of about 9384 km². The delta is characterized by flat terrain interlaced with an intricate system of rivers and tidal channels which carry down stream enormous quantity of sediment-laden water. The rate of total outflow to the Bay of Bengal through Bangladesh varies from 103900 m³/s in August to 8780 m³/s in February. When the holding capacity of rivers, small streams and bowls (depressed areas) and low lying land is exceeded, flood occurs. Flood is a recurring phenomenon in Bangladesh and often it has been within tolerable limits, but in recent years abnormal floods have become more frequently. In 1988 nearly 1/3 of the land surface was flooded.

The sediments carried by the river system is estimated to be 24 billion tons per year. These sediment are subjected to coastal dynamic process generated by river flow, tide and wind action. The ultimate result may be accretion in some places and erosion in other places. Studies by Bangladesh Space Research and Remote Sensing Organization (SPARRSO) using remote

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sensing technique indicates that sedimentation play an important role in siltation of riverine lands resulting in less holding capacity of the rivers. The deterioration of the river system due to siltation apart from causing floods, also impede navigation and causes erosion of river banks and creates socio-economic problems in the area.

The geographical location, geomorphology, topography and other natural conditions of Bangladesh have made her vulnerable to natural hazards which seriously disrupt environment and socioeconomic development.

Bengal basin is one of the largest geosynclinal basins of the world. The formation and growth of the Bengal basin are directly related to the origin and morphology of the Indo-Ganges trough which itself is overlaid and filled by sediments thousands of meters thick.

The Bengal basin is floored with quaternary sediments deposited by Ganges-Brahmaputra and Meghna rivers and their numerous tributaries and distributaries. The sediments are washed down from the highlands on the three sides of the basin, particularly from the Himalayas where the slopes are steeper and rocks less consolidated.

River morphology in Bangladesh

The bulk of water passes through the Ganges, Brahmaputra-Meghna river system, their tributaries and distributaries. This network of rivers control the landform, topography and cultural pattern of the entire Bay of Bengal basin.

Dramatic morphological changes have occurred in the Bengal basin due to shifting of river courses in the past. These changes are attributed to natural calamities like floods, cyclones, storm surges, earthquakes and so on.

The flat topography of the basin and the occurrence of recurring floods causing change rivers, have complicated the river morphology pattern and thus of the environment.

Rainfall

Bangladesh is situated in the active monsoon region with an average rainfall of around 90 cm per year. The distribution of rainfall is highly uneven throughout the year. About 3% rainfall occur during periods from November to February about 20% occurs during March to May and about 77% occurs during monsoon, lasting from June to October. Spatially also rainfall varies from 50% of the average in some areas of the north and 30% of the average in north eastern part. Drops in rainfall may seriously affect the crops. Thus drop of only 10% of average rainfall of the whole year during Jan. — May 1979 caused serious crop losses. Meteriological studies reveal that a major draught is experienced in Bangladesh once in every 8 to 10 years and affects 40 to 50 percent of the country.

Cyclonic Storm

Cyclonic Storms are an important feature of the Bangladesh climate and cause loss of life and property, crops and so on. Two types of cyclones form in the Bengal bay, one is the tropical cyclone which forms during the pre and post monsoon seasons and the other monsoonal depression and develops during southwest monsoon season. Tropical cyclones are

the most destructive and generally cause damage in different ways: flooding due to excessive rainfall, wind blowing away homes, ships and boats. About 90% of cyclone casualties are due to storm surges which reaches five meters or more in height. Principal source of energy of tropical cyclones is the latent heat which is derived from water vapor in the cyclone. The increase in sea surface temperature may lead to more evaporation and hence more energy for cyclone. Satellite imagery are used to detect, monitor and forecast the formation, movements and intensity of cyclone that form in the ocean water and thus make timely warning possible. Recent study of SPARRSO (1986) on coastal dynamics using landsat imagery and survey of Bangladesh topographic maps reveals that erosion is taking place all along the Meghna mouth. Large scale erosion, the shifting of islands from one place to another, reduction of large islands to smaller ones, large scale erosion of Hatiya and Sandwip are noticed.

Forests

Bangladesh has only about 16 % of the land under forests confined to northeast (Sylhet) and east, southeast (Chittagong, Mymensingh and Chittagong Hill Tracts) and mangrove forest of Sundarban coastal area. Forest area due to over-exploitation poaching and population pressure has declined to about 10%. The deforestation has lead to disappearance of vegetation cover and replacement of valuable trees with less valuable tree species. Afforestation through scientific silvicultural is to strictly followed in future.

Coastal area

The coastal environment of Bangladesh comprising the complex delta of the Ganges Brahmaputra-Meghna river system present an unique feature and because of its immense resources and delicate ecosystem needs to be separately highlighted.

The river system carries on estimated annual sediment load of 2.4 billion tons which are subjected to coastal dynamic process generated mainly by river flow, tide and wind action leading to accretion and erosion in the coastal areas.

The coast of Bangladesh covers about 710 km in length and can be broadly divided into three district regions.

The eastern coast line runs along the southern tip of the main land and can be classified as "Pacific type" running parallel to young mountain range.

The central region runs east of Tetulia river to Big Feni river estuary and includes mouth of the Meghna river and is characterized by heavy sediment input, formation of Chars (new lands) and bank erosion. This region is the most dynamic and most of the accretion and erosion occurs here.

The western region covers the portion of Bangladesh coastline west ward from Tetulia river to the international border located at the Hariabhanga river. This region can be termed as "Atlantic Type" in which the west line in general is transverse to the structure of the continental margin. Accretion does not occur much in this region.

Topographical change

Massive topographical changes have occurred in the Bangladesh coastal area since 300 B. Studies have also shown changes over the last two centuries leading to enormous impact on the life style of more than 20 million people of the coastal region covering about 36000 km. Present rate of sediment influx suggest a regional rate of denudation in the Himalayan source of over 70 cm per thousand years.

Typical delta features are: deposition of river sediments and subsequent extension of delta into the sea, rapid change in the configuration of the river channels and the shifting of those channels, flatness and low elevation of the level land, and effects of astronomical tide and storm surge on the river stages in the downstream reaches.

Erosion and sedimentation in the west are greatly influenced by tide.

Recent study by SPARRSO (1986) on coastal dynamics using landsat imagery and survey of Bangladesh topographic maps reveals that erosion is taking place all along the Meghna mouth. Large Scale erosion, the shifting of islands from one place to another, reduction of large inland to smaller ones large scale erosion of Hatiya and Sandwip are noticed. These phenomena occur because the channel depth of the Meghna river system has been considerably reduced and as a result bank erosion is a normal phenomenon.

Mangrove ecosystem

Bangladesh is one of the largest mangrove ecosystem in the world which serves multiple functions: food source for off-shore fisheries; coastal protection; economic and commercial forest resources; recreational resort; essential element to on-shore shrimps cultivation.

Mangroves are over green forests between the land and the sea occupying tracts along sheltered coast, estuaries and deltas where they are influenced by tides, salinity and rainfall. Mangrove form an unique environments and floral-faunal assemblage. They are possibly the simplest and best defined of ecosystem among/tropical forests (UNESCO, 1981). Mangroves are best defined by tree species but not by animals. The dominate biological featuring mangrove ecosystem is a relatively low degree of species diversity especially of plants. Mangroves consist of trees and bushes growing below the high water level of spring tides and their root system are thus regularly inundated with saline water. Among its major characteristic is that it is an open system, linked upstream with the land and downstream with the sea. Its nutrients are primarily derived from upstream catchment or from tidal flooding while organic materials are transported towards the sea.

FLOODS

Annual flood in Bangladesh has been a recurring phenomenon and flood water provided rejuvenating silt to plains in Bangladesh sustaining their fertility. During a normal monsoon about one third of the delta area comes under water and record show that flooded areas varied from 5000 to 55000km². However the frequency and intensity of floods in recent years have assumed catastrophic proportion because of various contributory factors, some of which are:

low topography of the country with major rivers draining through it; intensive rain fall in the upcountry; snow melt in the Himalayas and glacial displacement; river siltation / lateral river contraction; synchronisation of major river peaks; afforestation and denudation of catchment areas; denudation of river sides which at one time were lined with wet-land grasses; construction of embankments, storage reservoir and diversion structures in upper riparian tract; tidal and wind effect on slowing down river outflow; drainage congestion.

Man-induced factors

Man-induced environmental problems created through deforestation, inappropriate land and water use, pollution of water bodies through industrial and urban waste as also through pesticides fertilizer and other toxic chemicals are getting more and more acute and are exacerbated by demographic pressure which makes mockery of many development plans aimed at restoring environmental protection and ecological balance.

Himalayan snow melt

Two of the major rivers Brahmaputra and Ganges have their origin in the Himalayan region and they (together with many of their tributaries and distributaries) are fed by the snow melt from Himalayas along with south west monsoon. With the rise of global temperature because of green house effect, the snow melt and its intensity and timing will change and the discharge in the rivers will be augmented, thus contributing towards flood in the lower basin. The nature and timing of the snow melt need to be studied in detail.

Destruction of forest

As major rivers have their origin in Himalayan region, destruction of forest cover in the catchment areas, does accelerate erosion of soils and increase sediment load which in its turn raise the river bed in lower reaches and increase the intensity of bank spills. The severity of destruction of vegetation covers in hill areas for fuel use has intensified recently.

Agricultural land use and environment

Rice based continuous cropping system with modern rice varieties (with short straw length) and with chemical fertilizer and without supplement of organic manure or rotation with legume crops is leading to nutritional deficiency mostly micron nutrients like zinc and sulphur together with structural change of the soil. The present cropping system gives nothing back to the soil in form of residues and takes little care in adding cow dung or compost or green manure which at one time sustained the health of the land. The systematic depletion is having adverse effect on micro fauna and flora of the soil and thus its health.

Similarly indiscriminate use of pesticide is adding to the pollution problem. Removal of rice straw has reduced carbon content to dangerous level thus affecting healthy plant growth. Urbanisation is fast eating away prime agricultural land leading to not only environmental problem but socio economic instability.

POLLUTION

pollution in the sense it is used in developed countries has not assumed that much importance. There is a growing tendency by big industries to ignore environment protection measures. Paper pulp, fertilizer, leather and chemical industries and so on, are the worst culprits.

It may be mentioned that major pollution comes from rivers like Brahmaputra and Ganges, particularly Ganges which traverse great expanse in India where big cities in its bank discharge urban waste including chemicals and so on.

Over 1500 ships and 40-50 tankers visit Chittagong and Mongla ports every year. Besides hundreds of river crafts ply along waterways and discharge waste, oil spillage and bilge washing.

Bangladesh is yet to develop appropriate and effective legislation for prevention, control and regulation of pollution in rivers and port areas.

International Geosphere-Biosphere Programme (IGBP)

Bangladesh Academy of Sciences ICSU has set up a national Committee on IGBP as parts of its global net work.

Bangladesh has suggested that as priority area, IGBP immediately undertake studies on regional basis on: (a) devastation of the slopes of fluvial basin of the Ganges and Brahmaputra; (b) melting of snow in the Himalayan region; (c) soil erosion; (d) global and regional changes in the climatic condition; (e) salinity of ground and surges waters and (f) evaluation of the sea level. These studies will provide useful data that will dictate national action programme on flood control and so on.

Bangladesh and environmental management plan

Bangladesh is in an unenviable position in meeting the challenges posed by problems of environment and ecology from within the border as also those arising at regional and global level.

Problems at national level also include floods, deforestation, inappropriate land and water use, degradation of coastal areas (including mangrove forest), river pollution and so on. Some of these problems are being tackled by government through policy measures and selective development programmes: flood to be controlled through embankment, dredging of river beds and so on; massive social and agro-forestry programme aimed at restoring vegetation cover and thus environmental health; conservation of declining forest areas through stricter regulation and monitoring; formation of a coastal environmental management plan involving participation of people of the coastal area; development of appropriate land and water use pattern for a sustainable farming system involving crops, livestock, forestry and fishery and more rational use of agricultural waste; providing compulsory primary education; providing clean drinking water for every village; creation of a ministry of environment and forestry responsible for formulation of plans, policies and guideline for environmental protection and maintaining balanced eco-system.