IMPACTS FROM TRANSBOUNDARY WATER RIGHTS VIOLATIONS IN SOUTH ASIA

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ABSTRACT

Indian operations of upstream water diversion constructions on transboundary rivers caused sedimentation in river beds and drops in river flows to no flows destroying the aquatic habitats for Gangetic fishes and dolphins, and shortage of irrigation water in Bangladesh. In the Ganges basin alone, floodplains and ponds face a water shortage by 50% causing destruction to the natural breeding grounds of 103 Gangetic fishes. Further consequences have been extinction and endangerment of aquatic species, malnutrition among people, loss of skilled professionals, a shift in agricultural practices, obstruction to pastimes, water sports, and religious observances, closure of irrigation and industries, over-dependence on groundwater, inland intrusion of saline water and damage to Sundarbans, climate change and outbreaks of environmental diseases, arsenic contamination of groundwater, the problem of rehabilitation of arsenic patients, and occurrences of devastating floods. Additionally, the upstream country has planned to divert water from the Brahmaputra, the Meghna, and the Tista, signaling the same series of effects for the remaining two-thirds of Bangladesh. To protect the riparian civilization and international water rights, the UN should play the key role to establish fair-sharing of water among the riparaian nations instead of leaving the issue with them.

INTRODUCTION

Bangladesh has 59 transboundary rivers with neighboring India. The principal ones are the Ganges, the Brahmaputra, the Meghna, and the Tista (Fig. 1). At least 30 rivers have upstream water diversion constructions out of which Farakka Barrage upon the Ganges is the most damaging one. It was built 18 km upstream from the Indo-Bangladesh common border to divert water flowing through the Bangladesh Ganges to the Bhagirathi in West Bengal to increase the navigability of the Calcutta Port located a 260 km downstream. The Bhagirathi lost navigability after the discharges of its tributaries from the west side were obstructed by major dams constructed under by Damodor Valley Corporation. Sourcewise, Bangladesh has 76.5% of its water from the transboundary sources, 22% from rainfalls, and 1.5% from groundwater (Hossain et al., 2003).

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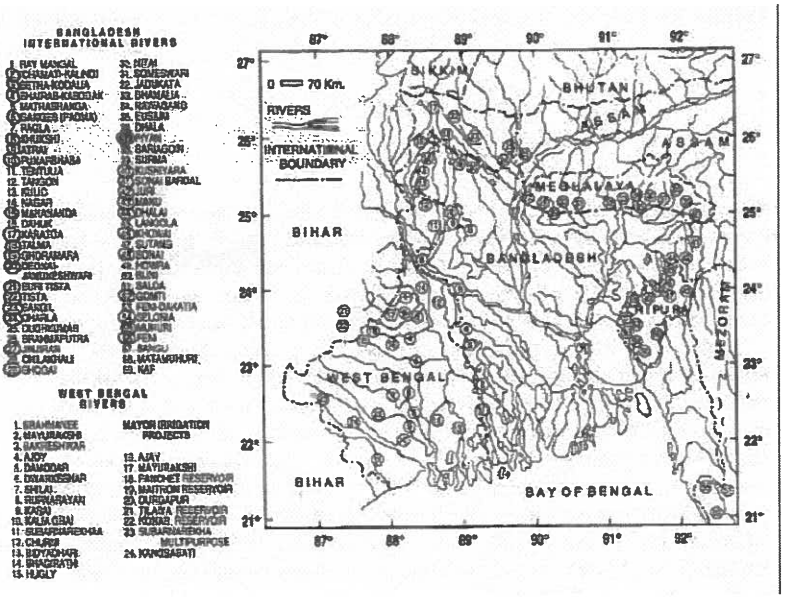

Figure 1. Transboundary rivers between India and Bangladesh

This article presents the downstream effects upon Bangladesh from upstream water withdrawals during the dry season and water release during the flood season by neighboring India, and suggests world nations to consider water diversion as important as an issue as the reduction of greenhouse gases in the atmosphere to save riparian civilization.

IMPACTS FROM HYDROLOGICAL CHANGES

Drop in Ganges Flow. The Ganges flows for pre- (prior to 1975) and post-Farakka periods at the Farakka point and the Hardinge Bridge point (about 174 km downstream from the Indo-Bangladesh border) have been compared in Fig. 2. It shows severe dry season drops in flows at the Farakka point in 1980 compared to that in 1900 and 1850. The drops at the Hardinge Bridge point are shown for 1963 and 1993. Water withdrawals in all seasons are noticeable from the comparison of curves for 1963 and 1993. The low flows have created sedimentation on river beds, particularly, at the points of origin of the distributaries where the current speed drops due to change of direction of the current into the distributaries.

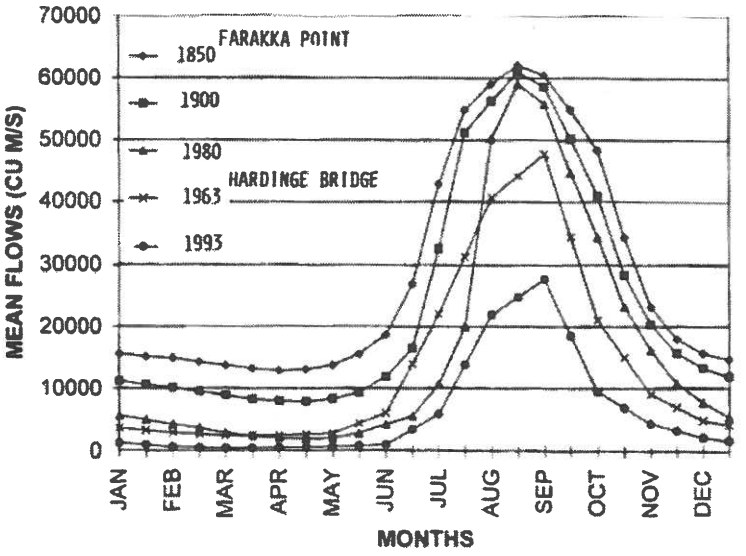

Figure 2. Decreasing flows at both the Farakka and Hardinge Bridge points

Conditions of Distributaries. The Baral (about 80 km long) is the first distributary of the Ganges in Bangladesh. The perennial water source is mostly dry in its first 30 km –course and sites beyond this due to the development of a huge shoal of about 1 x 0.50 sq km at the mouth. The Musa Khan River originates from the Baral at about 20 km downstream. All the aquatics and amphibians that lived year-round in stretch of 20-km watercourse in the Musa Khan are gone forever. The frolicsome scene of the Gangetic dolphins in this river is a legend now. More than 900 sq km of the basin area has not received the Ganges water since 1975.

The Gorai (50 km downstream) is the principal distributary of the Ganges. The water course is about 225 km long. The basin area is at least 10,000 sq km. The decreasing trend in discharge is presented in Fig. 3. Also, huge shoals have appeared in the Gohrai bed.

In a ten-year (1973-83) survey of the Ganges and the distributaries, the total number of shoals increased by more than 6 times, the areas of shoals increased by more than 10 times, and areas of the distributaries decreased by 2.5 times (Elahi and Saleheen, 1992). Shahjahan estimated that, as of 1993, 2,500-miles inland navigable routes were shrunk to 600 miles due to the water withdrawal (Shahjahan, 1993).

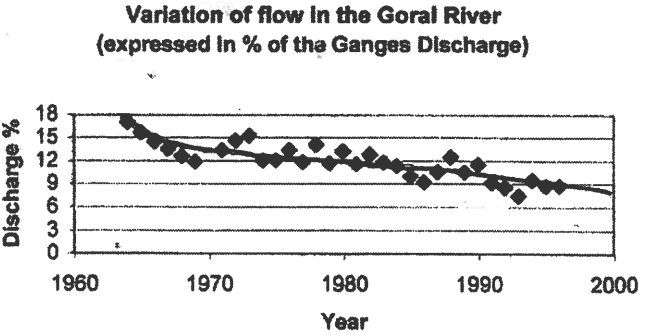

Figure 3. Decreasing flows in the Gohrai

Floodplains. Floodplains holding water for 12 months within depths of 1.1 to 2.2 m, 10 to 11 months within depths of 0.70 to 1.120 m, and 8 months within depths of 0.25 to 0.60 m, can now hold water for 6 months, 4 months, and 1 to 3 months, respectively. An overall water drop is about 50%. Surveys of ponds also showed a similar decrease.

Depletion of Fish Breeding Grounds. The loss of water by floodplains has depleted the natural fish breeding grounds in flood plains and canals. Fish had been the cheapest source of animal protein (6.25%), one of the indispensables of life, and calcium (25%). In 1981-82, 76 and 97% of the project area population had calcium and protein deficiencies. Now, in the event of almost doubling the population, this cheap nutrient source is scarce. Further, frogs, snails, turtles, and disliked species of fishes were rendered extinct because of the loss of their habitat before an inventory could be made.

Loss in Industrial Sector. Shoals in the Ganges and its weak flow fails to provide adequate water for production factories like paper mills, jute mills, nerwspint mill, and power station, and irrigation projects, and river port operation. From December 1975 to June 1976, Bangladesh faced a loss of about $783 million in the industry sector (Crow et al., 1995).

Inadequate Recharging of Groundwater. Due to the reduction of the available size of natural recharging grounds (floodplains, ponds, canals, and ditches) and quantity of recharging water, and overdependence on groundwater in irrigation, bathing, washing, etc., groundwater table is sinking. In pre-Farakka days, depth of handtubewells was 8 m, at most. In post-Farakka days, Tara pumps are replacing handtubewells. These pumps are set to a depth of more than 15 m.

IMPACTS FROM CLIMATIC CHANGES

Climatic Changes and the Consequences. From the analysis of pre- and post-Farakka climate data, it was found that rainfalls decreased by 30%. Also, the heating and cooling degree days increased by 1.33 and 1.44 times, respectively, in the post-Farakka era (Fig. 4). Further, weather-related discomforts of the pre-Farakka days are now occurring at relatively low temperature and humidity in post-Farakka days. Temperature variations are causing hypertension, stroke, and several other diseases (Adel, 2002).

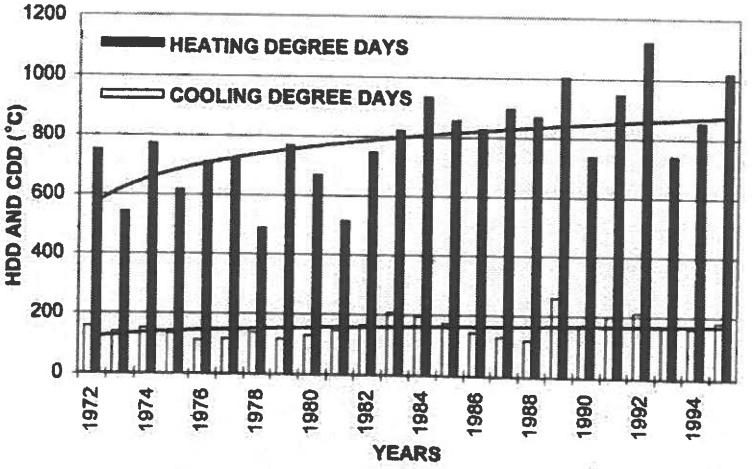

Figure 4. Heating and cooling degree days are on the rise

Salinity Intrusion. Low river flows has favored inland salinity intrusion affecting the timber production from trees like Sundari, Gewa, Keora, etc. in the Sundarbans the world's largest mangrove forest and destroying more than 60% of the marketable timber.

IMPACTS FROM SOCIETAL CHANGES

Shifts in Agriculture and Professions. Due to the shortage of water, farmers cannot produce jute that needs retting water. The cash crop jute is replaced by rice and sugar cane cultivation. Jute would give them cash in hand during the annual bad economic. Also, many of the rural professionals have forgot their skills for not having an opportunity to use them. Besides, cottage industries in the Ganges delta have been destroyed. In golden days of fishermen during the pre-diversion era, an average size fishermen's village having about 150 fishermen, could make about 350 fishing nets of 20 varieties for catching 15 to 20 types of fishes.

Obstruction to Religious Observances, Water Sports, and Pastimes. The Hindus, the main minority group in Bangladesh cannot perform the post-funeral pyre rituals. With the depletion of surface water resources no opportunities for the angling pastimes exist. The post-Farakka generation in many areas of the Gangetic Bangladesh cannot learn swimming and other water sports because of the lack of the facilities.

IMPACTS FROM GEOCHEMICAL CHANGES

Groundwater Contamination. Arsenic contaminated groundwater has plagued the Gangetic Bengal basin. Fig. 5 illustrates the level of contamination. It is believed that the sinking water table has increased the aeration zone exposing buried arsenopyrites to atmospheric oxygen to form water-soluble compounds. Later, the water-soluble arsenic compounds mixes with groundwater via infiltration. It is a huge social problem for the government to treat and rehabilitate the arsenic patients. It has rendered the society unstable because of marriage break-up if a spouse is affected by arsenic.

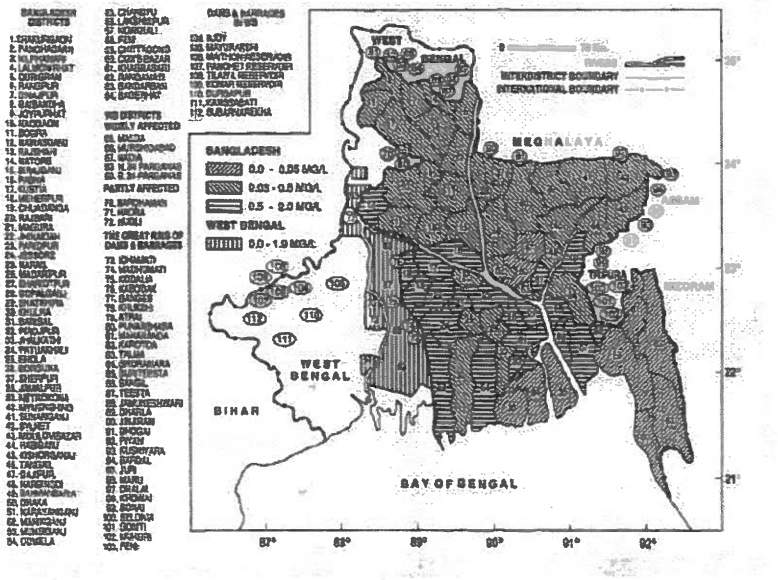

Figure 5. Arsenic affected areas in Bangladesh and West Bengal in India

Other Water Diversion Construction. The Tista River originates in the hilly region of northern Sikkim and flows for 112 km before meeting with the Brahmaputra at Chilmaree. The average width of the river is 160 m. India's withdrawals of 42.5

m^3/s of water in the dry season affects agriculture and navigation in the Tista basin. Also, the water diversion from the Mahananda river during the dry season affects agriculture, industry, employment, and natural balance in the Mahanda basin.

Increase of Flood Frequency. The upstream country uses dams as flood outlets when she cannot withhold the rising flood water. Sometimes, the Bangladesh border forces have to guard against the upstream country's border security forces' action of water release through Bangladesh (Adel, 2001). Floods take away lives and properties. Tens of kilometers of arable land are eroded away that are deposited as sediment downstream to cause inland navigation problems cutting off between the northern and the central part of the country. Fig. 6 shows no reduction of flood devastations in the post-dam era. The mid-July flood alone cost about US $7 billion in 2004 surpassing all previous records while August flood is yet to come.

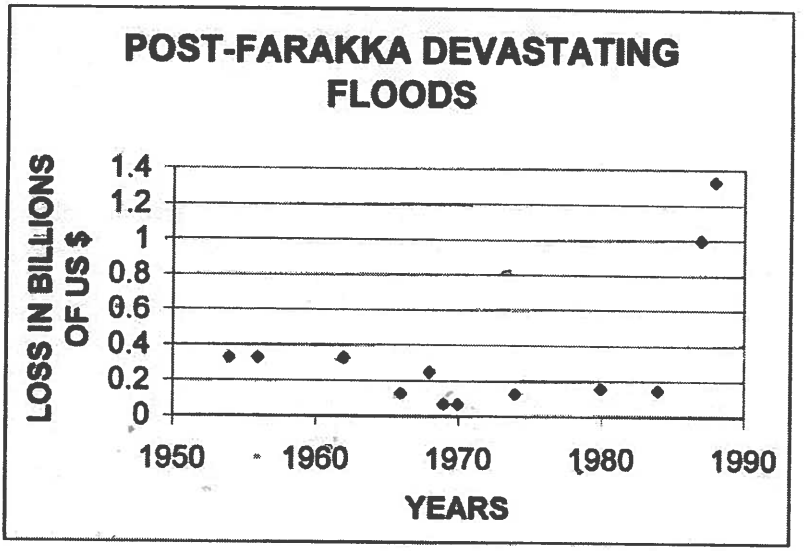

Figure 6. Devastating floods occur in post-Farakka days

Brahmaputra. Under a grand river networking plan, India will take the water from the Brahmaputra to the Cauvery of south India through about 1,500 km canal. The distributaries of the Brahmaputra in Bangladesh are the Old Brahmaputra (branches off at about 55 km downstream, 6,400 sq km basin area) and the Dhaleshwar (branches off at about 150 km downstream and about 3,200 sq. km basin area). Fig. 7a, 7b show the already dwindling flows in the old Brahmaputra and the Dhaleshwari (courtesy of Hossain et al., 2003)

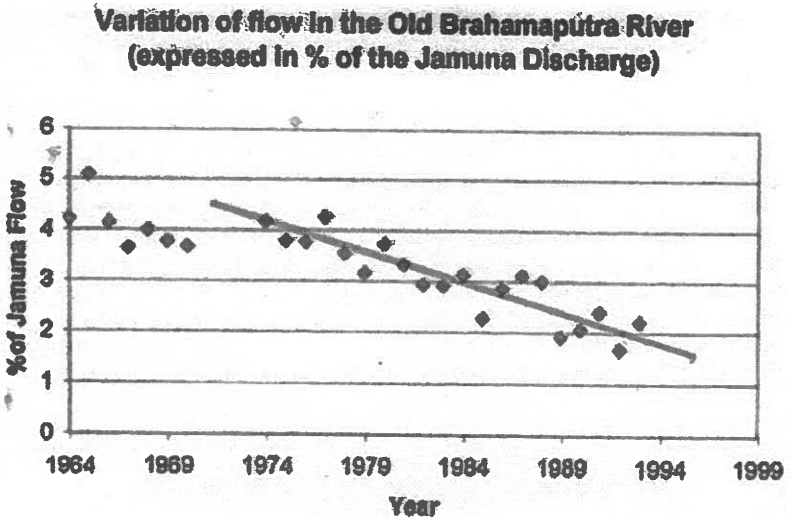

Figure 7a. The already dwindling flow of the Old Brahmaputra

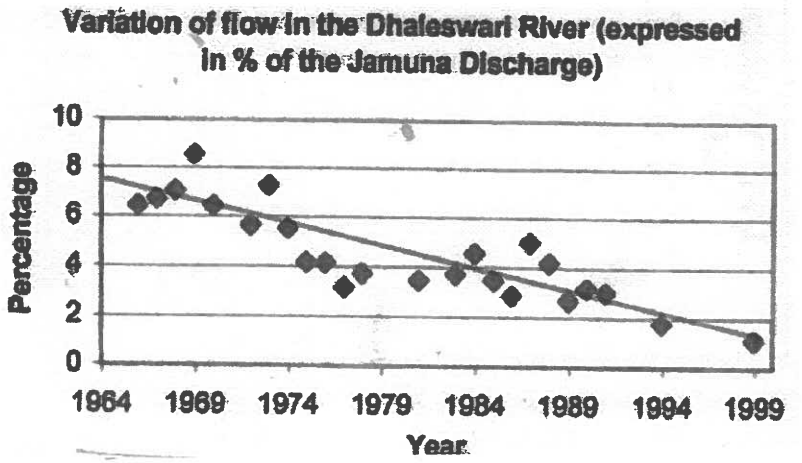

Figure 7b. Decreasing flow in the Dhaleswari river

Water Diversion From the Meghna. The Meghna river washes the north-east past of Bangladesh. Several transboundary rivers form its head stream. The Barak Barrage (315 - high and 161-m long) built near 25 degree parallel at Teepaimukh located between Assam and Monipur provinces, will store about 16,000 cubic

meter of water (Satter, 1998). Water diversion by this barrage will cause ecocide in the Meghna basin.

Total Impact. The total impact for a developing country is $TS = 630a + 410b + cd$ (Foster, 1976; 1980) where TS = total stress; a = number of deaths which are related to floods, environmental diseases like asthma, hypertension, stroke, heatstroke, cold, fatal accidents, arsenic toxicity = 40,000; b = number of injuries which include all the sources for a, and additionally, from malnutrition following loss of fishes = 20,000,000; c = stress resulting from damage to the infrastructure which includes whole infrastructure of water supply in natural sources = $65 < c < 145$; and d = population affected by the event = 40,000,000. Thus the estimated disaster figure lies in the astronomical range!

Solution. World nations should get together to sign protocols like the Kyoto and Rio to maintain availability of quality water for all living beings. Water sharing treaties should be formulated, implemented, and supervised under UN observations. Violators of water rights should be punished by UN sanctions. Bangladesh needs international assistance to excavate her silted river and canal beds and build embankments for drainage and storage of excess water for wet and dry seasons and to reestablish the lost wetland ecosystem.

CONCLUSION

Water diversion constructions are like lock and keys in the hand of upstream country to control river flows. She uses the mechanism to divert the lean season flow depriving the downstream country and to release the flood season excess water to submerge the downstream country. Upstream dams and barrages have raised downstream river beds affecting agriculture, hydrometeorology, industry, navigation, and people's livelihood. Floodplains, the natural wells for recharging groundwater and the natural breeding grounds of fishes, fail to serve either purpose. This results in extinction of sweet surface water and sinking of groundwater sources. Fishes are becoming extinct. Oxygen-sensitive toxic minerals like arsenic buried in the alluvial soil are forming water-soluble compounds to contaminate groundwater. Further potential problems are beset with the upstream country's grand river linking plan to divert water from the Brahmaputra and the Meghna rivers. Feedback effects from each of the affected sectors further aggravate the situation. World nations should get together to establish international water rights laws to protect south Asian sweet water resources. Interests of all riparian nations should be considered for formulation, implementation, and supervision of all water sharing treaties under the auspices of UN. Bangladesh needs international assistance to make her rivers navigable and to construct embankments on them for flood protection.

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