

Nahid Islam

THE GANGES WATER DISPUTE : ENVIRONMENTAL AND RELATED IMPACTS ON BANGLADESH

INTRODUCTION

Although the concept that man himself is liable for his destruction by destroying the delicate ecological balance is a recent phenomenon, it emerged much earlier. On the other hand, considerable global concern has been noticed since the 1960s. However it is not till 1980s that the subject received attention from the standpoint of security of states which has so long been analysed in terms of power relations or in terms of military defence against external threats. Besides political, economic, ethno-religious and related factors, environmental pollution and destruction are now recognised as ever increasing sources of threat to security. Transborder implications of environmental problems not only add to the magnitude and complexities but also function most often as a source of inter-state conflicts in regional context. The idea goes that if a nation's environmental foundations are damaged its economy may well decline, its social fabric may deteriorate and its political structure may become destabilized. The outcome all too likely is conflict, in the form of disorder and insurrection within the nation or tension and hostilities with other nations.¹

1. Norman Myers, "Linking Environment and Security," *Bulletin of the Atomic Scientists*, June 1987, p. 46.

Environmental degradation acts as a threat to security in two ways. In broader perspective the unchecked exploitation of resources is causing deforestation, pollution, soil erosion, desertification and thereby endangering the survival of the entire human race by destroying the delicate ecological balance. On the other hand, the fallout of environmental degradation and indiscriminate exploitation of resources within one nation may affect the socio-economic as well as environmental system of another nation which in turn may give rise to tension and hostility between states of the same region. This paper deals with environmental security in this latter sense.

Environmental issues have become a common problem in nearly all developing countries. Apart from their conventional task of attaining military defence, political stability and economic development, these countries are facing severe environmental degradation. To meet the short term basic demands of the growing population, these countries are bound to exploit the limited natural resources leaving no scope of renewal. The end result is the reduced ability of the ecosystem to support life called, 'carrying capacity' which forces people to move from their homelands to join the group popularly known as 'Environmental Refugee.' These displaced people are subject to social injustice and economic grievance which force them to resort to crime, open hostility and conflict causing political instability. When these people in search of fertile soil cross border and create extra pressure on the resources of other state this might constrain the relations between neighbouring states. When the source of environmental degradation is a bordering state then also the political relationship among states concerned is sure to become bitter. In short, problems of environment can not be dealt with in isolation from a wide range of social, economic and political ramifications.

Just how close the connection can be between environmental, social and economic problems on the one hand and security on

the other is demonstrated in South Asia specially between India and Bangladesh. Situated in the belt of the Himalyan ecosystem, the countries of the region share more or less the same river system originating mostly from the Himalyas. Developmental activities in the upper riparian states are causing great environmental disturbance for the lower riparian state in the form of desertification and flood which are in turn affecting the society and economy. The impact of deforestation in the upper reaches and mainly the construction of Farakka Barrage on the river Ganges, on the lower riparian, Bangladesh, clearly illustrate such situation. Bangladesh is geographically situated in a position to bear the most severe burdens of any disturbance in the nature created by these which in turn lead to continued strain on the relationship between the two neighbours. Moreover problems of environmental pollution and degradation in these two countries are closely interwoven with such issues as overpopulation, poverty and underdevelopment on the one hand and politico-strategic dimension of interstate relations on the other which has for long been characterized by historical mistrust, endemic tension and occassional hostilities.

In this paper an attempt is made to illustrate how environmental degradation, poverty and underdevelopment interact in case of third world countries and consequently affect the socio-economic and political life. In this connection the impact of Ganges water dispute on politico-economic and social life of Bangladesh has been studied. An attempt has also been made to focus some light as to the possible approaches to the problem.

THE PROBLEM OF ENVIRONMENT IN THE DEVELOPING COUNTRIES

There is no denying the fact that the world is increasingly interdependent environmentally as well as economically but it is

more pronounced in case of developing countries. Today environmental degradation is uppermost among the multifarious problems faced by the developing countries, which often act as a destabilizing factor within a country as well as a region.

Nature has its own cycle of change which changed the society and politics of many civilizations. A rise in mean temperature in North America and Eurasia during 900 to 1300 AD witnessed the 10,000 Viking settlers in Greenland.² Similarly the accelerated cooling during the sixteenth century which disrupted agriculture in various parts of the world witnessed social unrest and revolution specially in Ireland, France and Russia. But the nature-made change and resultant instability in society occurs through a larger time frame, hence people do not suffer much and get the time to adopt to the change. But whenever man-made components are present behind the change in the ecosystem, it produces such unnatural disaster that the result becomes catastrophic.

The share of burden of such change is more on the developing countries even though the responsibility of such change befalls more on the developed countries. Being economically and technologically backward, the developing countries are largely dependent on the nature for their survival and are helpless in facing the disturbance in the balance of the nature.

Agriculture is the backbone of developing economies. Yet throughout the Third World, farmers have been forced by financial and population pressures to adopt shortcut methods that are leading to long term land degradation.³ By interfering with important natural cycles and overusing fragile and barely stable

2. Neville Brown, "Climate, Ecology and International Security," *Survival*, Nov/Dec 1989, p. 522.

3. Jodi L. Jacobson, "Environmental Refugees : A Yardstick of Habitability," *Worldwatch Paper*, No. 86, November 1988, p. 16.

ecosystems they are creating a self-reinforcing cycle of land deterioration.⁴ When domestic productions fail to support the population of a given land, it has no choice but to borrow from developed countries and development activities become increasingly dependent on loan and aid. To pay the loan back these countries draw more heavily on the natural resources, hence further denying the long-term economic development. Compounding the problem is the fact that the developing countries must cope with a highly competitive world market in which they start from an inbuilt disadvantage of underdevelopment and technological backwardness.⁵ To compensate they must exhaust resources at an even faster pace. Deforestation in Brazil and Nepal, desertification in Africa, soil erosion in the Carribean and Latin American countries, drug production in Peru, Columbia, Bolivia and Pakistan, acceptance of nuclear and chemical wastes by some West African states, West Guinea, Guinea Bissau, Benin and so on are all viewed central either to feed people and to achieve growth or to debt servicing. Therefore, the third world developing countries are caught in this vicious circle, the end result of which is the downward spiral of the supporting capacity of environment.

Unsustainable land use practice, overpopulation, scarcity of water, loss of top soil, deforestation, etc., have reduced the habitability of the entire Africa to an unexpected scale. Sahel, the largest agro-ecological belt, today is threatened by total loss of arable land. Migration of Sahelians to the coastal African nations represents the largest migration ever witnessed. According to the Earthscan report, by 1985 some 60,000 Chadians had fled into western Sudan, 40,000 into the Central African Republic, 8,000 into Cameroon, 12,000 Mozambican refugees in camps in eastern

4. *Ibid.*

5. Yezid Sayigh, "Confronting the 1990s : Security in the Developing Countries," *Adelfi Paper*, No. 251, p. 42.

Zimbabwe and at least 28,000 Angolan in the Zaire.⁶ Land degradation and migration of people have heightened tension between different groups and states. The root of hostility between Ethiopia and Somalia can be traced in the agricultural decline of Ethiopia affected by environmental degradation of that country. Swelling food prices and loss of top soil induced agricultural migration to border lands in Ethiopia which aggravated the existing tension between the two countries and resulted in military conflict. All these countries, viz., Ethiopia, Sudan, Chad, Mozambique and Angola are also among the six most severely affected by hunger as listed by the United Nations.⁷

Similar situation is prevalent in the Latin American countries specially in El Salvador and Mexico. El Salvador has one of the worst rate of soil erosion, deforestation and depletion of water supply. The economic decline is forcing large number of people to return to state of subsistence in which their main option is to exploit the meagre natural resources available.⁸ Others in huge numbers have been forced to migrate, mainly to the US. From 1979, tension, conflict and civil war have become the regular phenomena for the country and further pressure on resources, unemployment and migration would continue to create pressure for radical political change. In Mexico also the limited arable land which the country possesses are mostly dry and highly salinized. High scale of deforestation leads to release of all the rain water at a time causing flood. On the other hand, scarcity of water supply and soil erosion force 400 sq. miles of farmland to be abandoned each year.⁹ The cities of Mexico have long become unable to absorb new arrivals and people are forced to move towards other

6. Johan Jorgen Holst, "Security and the Environment : A Preliminary Exploration," *Bulletin of Peace Proposals*, Vol. 20 (2), June 1989, p. 126.

7. *Ibid.*

8. Norman Myers, *op. cit.*, p. 34.

9. *Ibid.*, p. 36.

countries, specially to the US which for its part is constrained to adopt strict regulations on migration leading to new strains on their relationship.

Apart from land degradation and consequent migration, environmental resources often becomes the source of contention when the same resources are shared by two or more countries. But the reason is also the same, i.e., pressing need to make development for a growing population. Water related problems around the world can be cited as example. Water which was once thought in terms of abundance has now become a scarce resource. The reason is that the combined fallout of overpopulation and environmental degradatoin have made these countries more dependent on the rivers. The growing pressure on the shared rivers are resulting in new interruptions or diversions of the water often unilateral by the riparians,, leading to increasing hostilities and conflicts.

Scarcity of water is the greatest source of contention in the Middle East. One of the contributing factors of Arab-Israeli war of June 1967 was the plan of diverting the headwater of the Jordan River by all the beneficiaries of the river, viz., Israel, Syria and Jordan. Israel already uses 95% of the renewable supplies available to it, largely because of its six-fold expansion of irrigated area since 1982.¹⁰ So serious is Israel to retain the water supplies that she seems to go to any extent to have West Bank and Golan Heights within her territory.¹¹ Otherwise Israel possess only 3% of the river basin within the country's pre-1967 territory.¹² On the other hand, Jordan is entirely dependent on the river for irrigation for a population of 2.9 million which will double by early next century at its current rate of 3.7% per year. Moreover,

10. Sandra Postel, "Water for Agriculture : Facing the Limits," *Worldwatch Paper*, No. 93, December 1989, p. 26.

11. Norman Myers, *op. cit.*, p. 31.

12. *Ibid.*, p. 28.

Syria's plan to construct an entire series of dams on the Yarmuk river, the main tributary of the Jordan river, will divert 40% of the river flow and will cause severe shortage in Jordan and Israel. All these might further escalate the constrained relations among the states of the region.

The river Euphrates is the source of contention among Turkey, Iraq and Syria. Iraq and Syria almost entered into war in 1975 because of the tension created by the construction of Thawrah Dam by Syria.¹³

Agriculture for 55 million people of Egypt is entirely dependent on the river Nile. But eight successive drought years in the watershed areas of Ethiopia and equatorial Africa reduced the Nile flows by mid 1988 to the lowest level since 1913.¹⁴ Moreover, Ethiopia which controls about 80% of the headwater of the Nile flow has plan to divert more upper basin water for itself which will further deteriorate Egypt's situation.¹⁵ This factor virtually determines Egypt's policy toward the conflict between Ethiopia and Somalia in the former's insistence on ensuring the full free flow of the Nile from its sources.¹⁶

Nile, Euphrates and Jordan are only three example of the many rivers which are the sources of contention among or between neighbouring countries. River Water disputes have already occurred in North America (Rio Grande), South America (Rio de la plata-parana), and South and South East Asia (Mekong and Ganges). Deforestation of watersheds of northern India and Nepal and diversion of the Ganges flow to Bangladesh by India have soured the friendly relation between India and Bangladesh. We now turn into a detailed discussion of this problem.

13. *Ibid.*, p. 29.

14. *Ibid.*, p. 31.

15. Sandra Postel., *op. cit.*, p. 26.

16. Yezid Sayigh, *op. cit.*, p. 46.

THE GANGES WATER DISPUTE

Situated in a close proximity to each other the countries of the South Asian region share the same ecology governed by the mighty Himalaya and same life style originating from the same cultural heritage. Based on ethnic, religious, political and other factors, the political map of the countries of this region has been drawn, but ecology remained the same. Therefore, development activities of every single division of this unit which are done on the basis of their own need is bound to put their impact on this shared ecosystem and thereby influence their relationship. Bangladesh, situated in a delicate region is the lower riparian of the common rivers shared by the Himalyan states. Activities in the upper reaches, like deforestation and their impact on the environment, agriculture and economy of Bangladesh very much determine the relationship among the co-riparian states.

The Ganges river dispute between India and Bangladesh centers around the question of an equitable share of its water for their respective needs and that of the best means of augmentation of its flow to meet the inadequacies in the supply of water during the dry season.

Bangladesh is bounded by the Bay of Bengal on the south, Burma in the southeast and elsewhere by India. It is a predominantly flat delta built up by the three major rivers, viz., the Ganges, the Brahmaputra and the Meghna. It has an area of 35.83 million acres, of which about 22.85 million acres (65.77%) are cultivable. The population exceeds 110 million which makes Bangladesh one of the most densely populated regions of the world.

Ganges, one of the most important rivers of Bangladesh, originates from the Gangotri glacier at the Southern slope of Himalayan range, flows in a south easterly direction, then further

downstream in an easterly direction through India to Bangladesh and finally empties into the Bay of Bengal. Amongst the major tributaries which feed the Ganges, three, viz., the Karnali, the Gandak and the Kosi flowing down from Nepal together contribute about 41% of the annual flow and about 71% of the dry season flow of the Ganges.¹⁷ The river Bhagirathi-Hooghly on which the port of Calcutta is situated takes off from the south bank of entry of the Ganges into Bangladesh.¹⁸ After crossing the Indo-Bangladesh border, the Ganges forms the boundary of the two countries for a distance of about 80 miles. After the river enters Bangladesh wholly, it flows for about 70 miles before joining the river Brahmaputra-Jamuna at Goalando, then joined by two tributaries of Ganges, viz., Mahananda and Baral, the river takes the name of Padma and later downstream joins the river Meghna at Chandpur. From this point, the combined course of the three rivers continue as the lower Meghna into the Bay of Bengal.

The river Ganges has highly seasonable flows. Eighty percent of its annual flow takes place during the four months of July to October. Nearly 82% of the rainfall in the Ganges plain also occurs from June to September. Therefore, the monsoon flow is enough to meet the requirements of both the riparian. Even the overflow often results in flood. More acute problem is faced during the dry season when the flow is insufficient to meet the need of both the countries. Hence any major harnessing of the Ganges water during dry season upsets its natural equilibrium and brings about a whole chain of important and inter-related repercussion.¹⁹ Unilateral undertaking of projects and plans has resulted in conflict of national interest. The problem has become critical after the diversion of its water by India from Farakka.

17. B. M. Abbas, *The Ganges Water Dispute*, University Press Limited, 1982, p. 10.

18. *Ibid.*

19. M. Rafiqul Islam, *The Ganges Water Dispute : Its International Legal Aspects*, University Press Ltd., Dhaka, 1982, p. 2.

The Farakka Barrage project, sanctioned by the Indian government in April 1960, was to divert the water of Ganges through a feeder canal into the Bhagirathi-Hooghly river for the improvement of navigation for Calcutta port. Siltation of the Hooghly river has always been a headache for the Indian government. But the experts, international as well as national, never considered the project a solution to this problem.²⁰ Citing the fact that Indian budget of 1965-66 characterized the Farakka Barrage project as of 'strategic and international importance', B. M. Abbas, an expert on Ganges water problem said that the real purpose of the barrage is to control the river for supplying Ganges water to the Indian states of Uttar Pradesh and Bihar. The barrage also provides a communication link across the river.²¹ More important factor is that the barrage offers to India a political leverage in her dealings with Bangladesh.²²

On the part of Bangladesh, the situation is desperate. Since the entire arable land is already under cultivation, increased cropping intensity and yield is essential to feed the growing population which requires year round irrigation. Moreover, due to flat terrain, it is not feasible to build storage dam in Bangladesh for conserving a part of the monsoon flow for use during the dry season.²³ The major rivers of Bangladesh, i.e., Ganga, Brahmaputra and Meghna have divided the country into four region, viz., south-west, south-east, north-east and north-west. The entire south-west region and a portion of the north-west region of the country, i.e., 37% of the total area and 30 million people is dependent on the Ganges river as the source of water supply. The area dependent on the Ganges river has the lowest mean rainfall in the country. It

20. B. M. Abbas, *op. cit.*, p. 14.

21. *Ibid.*

22. Nurul Islam Nazem and Mohammad Humayun Kabir, "Indo-Bangladesh Common Rivers and Water Diplomacy," *BISS Papers*, No. 5, December 1986, p. 11.

23. B. M. Abbas, *op. cit.*, p. 11.

varies from about 50 inches in the western portion of the Rajshahi district to about 120 inches along the coastline in the Patuakhali and Barisal district. The average rainfall is only a few inches for the period from November through March and is insufficient to sustain crops.²⁴ Reliable water supplies are, therefore, needed in this area during the dry season for agriculture which is the most important sector of the economy. It accounts for about 60% of the gross domestic product, gives employment to 80% of population and provides the base for more than 80% of the country's export.²⁵ Reliable water supplies are also needed during the dry season for domestic use, industrial purposes, maintaining adequate river depths to permit navigation, protecting the forest, avoiding damage to fish and limiting salt water intrusion. The supplies are also required to maintain favourable environmental conditions and ecological balance of the region.²⁶

By 1970, the construction of the Farakka barrage was complete except the feeder canal. After the liberation war and independence of Bangladesh, some positive developments took place, viz., the creation of 'Indo-Bangladesh Joint River Commission' to develop the waters of the common rivers (but not the question of water sharing) and a joint declaration at the ministerial level to augment the dry season flow of Ganges. By 1974 the feeder canal of the barrage became ready for operation. In April 1975, the two countries entered into an interim agreement whereby it was decided for provisional operation of the barrage for a period of 41 days from April 21 to May 31, 1975. Moreover, it was mentioned in the agreement that it was not an agreement for the final commission and continuous operation of the barrage was conditional on their arriving at a mutually

24. Dr. A Hannan, "Impact of Reduced Flow of Major Rivers of Bangladesh," a paper presented at a Seminar organised by the Department of Water Resources Engineering, BUET, Dhaka, August 23, 1980, p. 2.

25. *Ibid.*

26. *Ibid.*

acceptable solution. But what is notable is that India did not stop after the expiry of this period and continued the running of the barrage without "arriving at a mutually agreed upon solution."

In November, 1977, the parties entered into an interim agreement on the sharing of the Ganges dry season flow at Farakka as a short term solution to the dispute. It was agreed that of the total availability of 55,000 cusecs of water at Farakka, Bangladesh would get 34,500 cusecs and India 20,500 cusecs during the leanest period (last 10 days of April). The significance of the agreement is the 'guarantee clause' inserted by Bangladesh that if during a particular 10 day period the flow at Farakka came down to such a level that the share of Bangladesh was lower than 80% of the stipulated share, the release to Bangladesh during that 10 day period shall not be below 80% of the quantum shown in the agreement.²⁷ Meanwhile, it was agreed upon that in the course of three years of this interim agreement, the Joint River Commission would conduct a study and report on the techno-economic feasibility of a suitable scheme or schemes which could be implemented for augmentation of Ganges dry season flow at Farakka to satisfy the requirements of both countries as a long term solution to the dispute.²⁸

The 1977 agreement expired on November 1982. In October 1982, a Memorandum of Understanding (MOU) was signed between the countries as an interim arrangement for the sharing of the Ganges water for the next two dry seasons instead of renewing the 1977 agreement. Under the MOU the 80% guarantee clause for Bangladesh was dropped, which meant that India could now withdraw any amount of water from the Ganges. The MOU also expired in May 1984.

27. B. M. Abbas, *op. cit.*, p. 7.

28. M. Rafiqul Islam. *op. cit.*, p. 7.

The present position is that there has been a deadlock. In pursuance of the provision of the 1977 agreement, both India and Bangladesh came up with their respective versions of long term solution of the problem, neither of which is acceptable to the other. Bangladesh proposes to augment the dry season flow of the Ganges by conserving a part of its monsoon flow through construction of storage dams in the upper reaches of the river system lying in India and Nepal whereas India proposes to divert the water of the Brahmaputra into the Ganges above Farakka through a link canal across Bangladesh. Bangladesh rejected India's proposal on the ground that the link canal would divide Bangladesh, it would take away much of her precious land and also dislocate and disrupt a huge population and their life and will also cause a damage to the ecological balance of the country.²⁹ A huge chunk of the land will be isolated from the main land since both the ends of the link canal will be within the territory of India. On the other hand, India rejected the Bangladesh proposal on the ground that India, as a matter of policy, would not accept the inclusion of third party, in our case, Nepal.³⁰

IMPACTS

A. On Environment

Change in hydrology

Due to the diversion of the Ganges there has been a change in hydrology in Bangladesh. The water level of Hardinge Bridge fell below the minimum ever recorded, i.e., 23,000 cusecs as compared to a historical average of 64,430 cusecs.³² The water level registered at 17 feet compared to 22 feet while the ground water

29. Nurul Islam Nazem and Humayun Kabir, *op. cit.*, p. 17.

30. *Ibid.*

31. *Ibid.*

32. Khurshida Begum, *Tension Over the Farakka Barrage : A Techno-Political Tangle in South Asia*, UPL, Dhaka 1987, p. 131.

level fell by 5 feet.³³ The off-take of the river Gorai, the main distributory of the Ganges is at the point of extinction due to heavy siltation.³⁴

The consequences of hydrology change due to upstream diversion are as follows :

1. Siltation and rise of river beds leading to flood, demolition of river embankment, changed river course;
2. Decreased soil moisture and salinity leading to desertification;
3. Decreased water level leading to problem of agriculture, industry, navigation, fishery and domestic use;
4. Decreasing upstream flow leading to saline intrusion in the coastal area and damages to the mangrove forest;
5. The overall effect in the changed weather pattern.

Flood

Apart from deforestation and melting of ice in the upper region, the barrage contributed to a great extent to the flood in Bangladesh. Diversion of the silt free water into the upstream pushes a large volume of silt into the rivers downstream, thereby decreases the carrying capacity of the rivers. It has been shown in a study that 30% of the country is subject to flood due to spillover from major rivers while the flood from small rivers cover about 40% area of the country.³⁵ The major rivers carry about 2.4

33. *Ibid.*

34. See for detail, Khurshida Begum, *op. cit.*, p. 131-135.

35. Md. M. Huda and J. U. Chowdhury, "Flood and Erosion," Paper presented at a regional conference on Floods and Erosion, Dhaka 7-10 September 1989, p. 9.

billion tons of sediments annually resulting in gradual deterioration of morphological characteristic of the rivers.³⁶ More than 80% of the flood run off is brought from outside the country of which 90% is contributed by the major rivers.³⁷ According to a conservative estimate the damage due to flood is well over Tk. 6000 million a year on an average (in terms of damage to crops and properties).³⁸ The loss of life and human suffering is beyond any measurement.

Desertification

The process of desertification in the northern part of the country has been initiated largely by depleting soil moisture and increasing salinity. After the cessation of the monsoon rain, the occasional rainfall is not sufficient for agriculture and irrigation is entirely dependent on surface flow of water which reach to its lowest due to upstream diversion. It has increased the soil salinity in 21 districts of the country by 40%.³⁹ As a result the experts apprehend that more than 1.20 crore acres of cultivable area in as many as 21 south western and northern district of the country may turn into vast expanse of desolate arid land.⁴⁰ The lowering moisture context of soil is a sure sign of desertification. The critical point of moisture (lowest percentage of moisture in the soil), usually recorded in April or May before 1975 has come forward over the last few years to February.⁴¹ It has squeezed the land and the volume of Robi crop production in the greater Rajshahi, Pabna, Kushtia, Faridpur, Jessore, Khulna and Barisal districts. Rise in the surface water salinity and soil intrusion

36. Manirul Qader Mirza, *Holiday*, July 4, 1986; cited in *BISS Paper*, No. 5, *op. cit.*, p. 31.

37. Amjad H. Khan, "Flood : Problems and Prospect : A Regional Overview," Keynote address on a Regional conference on Flood and Erosion, cited in *BISS Paper*, No. 5, *op. cit.*, p. 31.

38. Manirul Qader Mirza, *op. cit.*

39. *Bangladesh Observer*, November 7, 1989.

40. *Ibid.*

41. *Ibid.*

salinity in the districts served by Padma will force a change in the usual cropping pattern in those districts.⁴² The course of the four rivers of Padma, Mohananda, Punarbhaba and Pagla consists of 123 miles of which 27 miles are now closed due to shoals.⁴³ Sometimes local boats become inoperative in some areas. The people of the Rajshahi district often experience such dust storm that totally disrupt normal life, which is a most unusual occurrence in a riverine country.

Salinity

Intrusion of salinity in the coastal area is another adverse effect of Farakka. The most affected region is recorded in those areas which are subject to the tides of the Bay of Bengal which occur twice a day. The saline intrusion is normally ousted by strong upland flow. Due to upstream withdrawal in the dry season flow of the Ganges, Gorai-Madhumati receives very insignificant flow to check salinity. As a result salinity front penetrates further inland in the region.⁴⁴ In 1968 the minimum discharge of water at the Hardinge Bridge was 58,800 cusecs and the salinity of the Passure river was 1000 micromhos per centimeter. In 1976 the water level of the bridge came down to 23,200 cusecs whereas the salinity of the river increased to 136000 micromhos. In 1982 the water discharge was 31,4000 cusecs and the salinity decreased to 11500 micromhos/cm.⁴⁵ This shows the relationship between the flow of water from Ganges and the level of salinity. To keep the salinity to a permissible limit (below 500 micromhos) the minimum Ganges flow at Hardinge Bridge should be about 28,000 cfs, which is very close to the pre-diversion average minimum flow in the Ganges.⁴⁶

42. *Ibid.*

43. Shams I Islam Tuku, *The Daily Shangbad*, (in Bengali) April 25, 1988.

44. *BISS Papers*, No. 5, *op. cit.*, p. 33.

45. Z. Karim, S. M. Shaheed, et. al., "Coastal Soils, Saline and their Management in Bangladesh" Bangladesh Agriculture Research Council, Dhaka, 1982; cited in Khurshida Begum, *op. cit.*, p. 137.

46. A. Hannan, *op. cit.*, cited in *BISS Paper*, No. 5, *op. cit.*, p. 33.

Salinity in the Passur and Sibsá estuaries reaches its maximum during the months of April and May. The 500 micromhos line engulfed an area of about 27,600 square km. during 1983 which has surpassed all the line of same concentration in other years.⁴⁷ In 1983, the 500 micromhos line reached about 13 km north of Kamarkhali and penetrated up to 300 km inside from the Passure mouth.⁴⁸ Salinity observed at Khulna topped all past records, reaching 17,000 micromhos in April, 1983.⁴⁹

Table 1 : Area engulfed by salinity of different concentration

Salinity Concentration Micro- mhos/cm	Prior to 1976		Area engulfed during the year in 10 sq/km.							
	Max Area in 10 sq/km		1983	1982	1981	1980	1979	1978	1977	1976
500....	186	276	246	227	243	223	215	238	263	
1000....	163	195	187	167	186	184	183	184	223	
2000.....	135	170	158	149	168	163	161	153	202	

Source : Ainun Nishat and Shahjahan Kabir Chowdhury "Water Quality : Problems and Needs for Integrated Control in Bangladesh," A paper presented at the Regional Symposium on Water Resources Policy in Agro-Socio-economic Development, Dhaka, 4-8 August 1985.

Forest

The world's largest single tract of mangrove called the Sundarban forest is located in the extreme southwest portion of the Ganges basin. With the withdrawal of Ganges water, the Sundarban also fell a victim of the process of desertification due to increasing rate of salinity and frequent drought which

47. Ainun Nishat and Shahjahan Kabir Chowdhury, "Water Resources Policy for Asia," a Paper presented at a Regional simposium on Water Reources Policy in Agro-Socio-Economic Development, Dhaka, 4-8 August 1985.

48. *Ibid.*

49. *Ibid.*

hampered the generation process of the local flora.⁵⁰ Sundari trees, after which the forest was named, are now in the process of extinction. The major forest crop, Sundari, was deteriorating rapidly in the areas influenced predominantly by the Sibsa and Passur.⁵¹

B. On Economy

The combined effect of siltation, soil erosion, decreased level of surface water and increased salinity is so grave for Bangladesh that stability of the country is at risk. Sectors like agriculture, industry, navigation, aquaculture of the northern as well as south-western part of Bangladesh has been suffering serious setbacks.

Experts on the concerned field estimate agricultural production loss for the reasons related to upstream withdrawal of the Ganges water at Farakka. The causes of damage related to water withdrawal at Farakka are water shortage, moisture depletion, salinity and delayed planting.

Of the total net cropped area of 6.85 million acres, 1.57 million acres are partially or fully affected. This amounts to 22.92% of the net cropped area.⁵² During the dry season of 1976 alone, over four hundred acres of land were affected due to soil moisture deficiency and increase of salinity.....approximately 53% of the irrigation facilities could not operate because of the decreased availability of water Rice production alone fell short by 236,000 tons or 20% of Bangladesh's food import.⁵³

50. *Bangladesh Observer*, November 7, 1989.

51. A Hannan, *op. cit.*, cited in *BIISS Paper*, No. 51 *op. cit.*, p. 19.

52. A. Hannan, "Impact of Reduced Low Flow of the Ganges," a Paper presented at a Seminar Organised by Department of Water Resources Engineering, BUET, August 23, 1980, p. 11.

53. Government of the People's Republic of Bangladesh, *White Paper on the Ganges Dispute*, September 1976, p. 8.

Irrigated crops usually suffer more from shortage of water. During the year 1988-89, total area affected for shortage of water are 38,449 hectares.⁵⁴ The area damaged due to water shortage in the year 1988-89 was 38,449 hectares as against 11,215 hectares of the year 1987-88.⁵⁵ The total area affected due to moisture depletion was 59,129 ha. which was 13,216 ha. more than the previous year. B. Aus was the worst affected crop and sustained yield loss was about 37%.⁵⁶ Intrusion of salinity in the soil imposes limitation on the cultivation of crops. Vast areas remains fallow during dry season. The area affected in the year 1988-89 due to salinity is 43,254 ha. against 8,218 ha. of the previous year.⁵⁷ The value of the total production loss of the Ganges dependent area has been estimated as Tk. 2,895.00 million or US\$ 85.00 million in the year 1988-89.⁵⁸ Therefore, it is apparent that the production as well as financial loss is increasing day by day.

Apart from decrease of surface water, agriculture is also disrupted due to alternate flood and drought. The main sources of flooding in Bangladesh are spill over from rivers, drainage congestion of local run off due to extremely flat nature of topography, storm surge and tidal blockage.⁵⁹ The major rivers carry about 2.4 billion tons of sediments annually resulting in gradual deterioration of morphological characteristic of the rivers.⁶⁰ Since the water of Ganges enter into Bangladesh after flushing the Calcutta port large volume of silt enter through the river and the river beds of the south western region are rising

54. Information received from a concerned office under Bangladesh Water Development Board (BWDB).

55. *Ibid.*

56. *Ibid.*

57. *Ibid.*

58. *Ibid.*

59. Md. N. Huda and J. U. Chowdhury, *op. cit.*, cited in *BISS Papers*, No. 5, *op. cit.*, p. 30.

60. Manirul Qader Mirza, *op. cit.*,

gradually making the area prone to flush floods. In the Ganges dependent area about 240,929 hectares of land has been affected due to 1988 flood.⁶¹ The crops damaged are mainly B. Aman, T. Aman, Sugercane etc. Yield loss varies from 100% to 39% in case of T. Aman. The most seriously affected districts are Faridpur, Madaripur, Gopalganj and Rajbari.⁶² It is worth noting that 10 years ago the Ganges had only one entry point into Bangladesh, but now it enters at two different points having a curved course of about 12 km. in the Indian territory.⁶³ Experts view that it is mainly due to diversion of silt free waters in the upstream and pushing a large quantity of silts into the Ganges in Bangladesh.

The drought situation is critical in the south western region because after the cessation of monsoon rain usually by October, occasional rainfall are not sufficient to eradicate soil moisture deficit. The possible measure against drought is supply of water from surface flow. But due to upstream withdrawal river flow dwindles down in the dry months. As a result aridity increases and the lands become parched. According to an estimate, Bangladesh has incurred a loss of Tk. 20,711 million since 1975 due to withdrawal of Ganges water. It accounts for 75% of the total loss.⁶⁴

Due to low water level resulting from reduced flow of water, irrigation pump lifts have significantly been increased at the Ganges-Kabadak pumping station at Bheramara during 1988-89. Dredging of the intake channel was required for which an amount of about Tk. 10 million was incurred for the said purpose.⁶⁵

61. BWDB source.

62. *Ibid.*

63. *Bangladesh Times*, April 30, 1985.

64. Manirul Qader Mirza, *op. cit.*

65. BWDB source.

Lowering level of water causes heavy siltation. The offtake of Gorai closes every year and repeated dredging of Gorai is required every year. An amount of Tk. 15.00 million was (including Tk. 5.00 million for Food for Works) spent for the clearance of the siltation during 1988-89.⁶⁶ The command area of the G.K. project is about 141,700 ha. of which 16,200 ha. of land could not be provided with irrigation for which an amount of Tk. 405 million has been estimated to be lost in terms of food production.⁶⁷

The reduced water availability significantly reduced the landing of fish probably because of disturbance of the historic food chain and inability of the fish to tolerate shallow depth and unprecedented level of salinity.

The government of Bangladesh claimed that the forest of Sundarbans which provides raw materials for newsprint mills, paper mills, match factories, furniture factories and all varieties of constructive activities is affected by salinity and has approached deterioration, causing a heavy loss which would be in fact irreparable.⁶⁸ The White Paper states "The forest is graded on a three tier quality standard with the quality and yield directly correlated with the soil salinity. The yield difference over a 20 year growing cycle between quality 1, the bulk of the Sundari (the principal tree of the forest), and quality 3 is 740 cubic feet per acre. Such a reduction in yields would naturally affect 45,000 people directly employed in clearing the forest as well as existing and planned industries which are and will be dependent on the forest products.⁶⁹ According to a study by a concerned office under BWDB, in April and May, salinity in certain areas of the forest reaches its peak and ranges from 4000 to 8000 micromhos/

66. *Ibid.*

67. *Ibid.*

68. Khurshida Begum, *op. cit.*, p. 143.

69. *White Paper on the Ganges Water Dispute, op. cit.*, p. 9.

cm.⁷⁰ Reduced water level and subsequent increased salinity has adversely affected the industrial sectors specially the thermal power stations and the paper mills situated in the south-western region of the country. After the commissioning of the barrage, the Goalpara thermal power station had to be closed for some time and though became operative after some time, the cost of running the station became much higher because sweet water has to be carried by barrages from long distance.⁷¹

According to a concerned office of the BWDB, the financial loss of power generation due to reduced water level and increased salinity is about Tk. 30 million. The Khulna newsprint mill operated at half the capacity as the Chloride content of the water used for the Mill increased by more than 20 times. Other industries also suffered equally.⁷² Although India contends that salinity level is always high in Khulna region and the increased level may occur due to human activities, but the type of abrupt change that has appeared would result only when a massive human activity took place in that area. But the fact is that no such unusual human activities took place in that area to make such a change in salinity level.

Navigation of this region also is affected seriously due to upstream withdrawal. According to the survey made by the Bangladesh Inland Water Transport Authority (BIWTA), the section of waterways most seriously affected are :

a) Ganges River : Upsatream of the confluence of the Ganges with Jamuna River;

70. BWDB source.

71. *The Farakka Barrage*, External Publicity Division, Ministry of External Affairs, Government of India, New Delhi, cited in Khurshida Begum, *op. cit.*, p. 143.

72. Government of Bangladesh, *Deadlock on the Ganges*, p. 3., cited in Khurshida Begum, *op. cit.*, p. 143.

b) Gorai River : at, and also from, its off, take point from Ganges-Kumarkhali, and

c) Madhumati River : downstream of Kumarkhali.

Immediately after the commissioning of the barrage, Bangladesh Government pointed out the critical condition of navigation, ".....Ninety miles of navigation routes on the Ganga (from Godagari to Aricha) went out of commission, 45 miles on the Gorai and 15 miles on the Padma.... In addition to these three specific reaches navigation throughout the entire region was hampered".⁷³ Although India contends that the route is negligible in transportation and a little dredging will solve the problem,⁷⁴ the real picture is totally different. Water route in the south-western region is very important in the economy of the country. At certain points like Barisal, no railway system is possible because of numerous water outlets. Moreover, dredging on a river like Padma where siltation is very high is costly, time consuming and not feasible at all. River Padma, on which the entire south-western region is dependent is becoming dry at an incredibly faster rate. The livelihood of thousands of fishermen and boatmen are at stake. BIWTA source reveals the most seriously affected areas as shown in table 2 below.⁷⁵

Other losses

The routes in the Ganges-Jamuna confluence have deteriorated in particular and caused difficulties in the operation of the ferry services linking the east and west zone of Bangladesh due to extra fall in water levels and consequent development of shoals. For maintenance of Ferry services, BIWTA had to carry out extensive dredging and frequent construction of ferry ghats involving a huge cost as shown in tables 3 and 4.

73. *White Paper on the Ganges Water Dispute*, op. cit., p. 9.

74. Khurshida Begum, op. cit., p. 145.

75. BWDB source.

Table 2 : Areas most seriously affected by Farakka

River	Reaches	Indicated draught in metre.	Minimum draught available in 1987-88	Minimum draught available in 1988-89
Ganges	Godagari Paksey.	1.37M (4'-6")	Closed (draught is less than 0.91M (3'-0"))	Colosed (draught is less than 0.91M (3'-0"))
	Paksey to Aricha	1.83M (6'-0")	Closed (draught is less than 0.91M (3'-0"))	Colosed (draught is less than 0.91M (3'-0"))
Padma	Daulatdia to Tapurakandi (Now C & B Ghat).	-do-	-do-	-do-
Gorai-Madhumati.	Off-take to Bardia.	1.37M (4'-6")	-do-	-do-
	Bardia to Khulna	1.83M (6'-0")	Open to vessels with draught 0.91M (3'-6") or less.	Open to vessels with draught 0.76M (2'-6")

Table 3 : Dredging cost for the year 1988-89 :⁷⁶

Name of shoal.	Name of river	Area, 000 m ³	Cost million taka
1. Daulatdia Ferry Ghat Basin/Channel	Padma	459	13.71
2. Khapura.	Jamuna	138	3.55
3. Aricha.	Jamuna	157	5.38
4. Char Safulla.	Jamuna	114	3.37
5. Nagarbari.	Jamuna	35	0.64
6. Bhuapur.	Jamuna	301	8.33

Table 4 : Cost for construction and maintenance of ferry ghats due to frequent shifting of ghats for the year 1988-89 :⁷⁷

Sl. No.	Name of ferry ghats.	Cost in million Taka
1.	Aricha.	1.66
2.	Nagarbari.	.74
3.	Daulatdia.	.82

From the above, it is apparent that the economic life of the country, particularly the south-western and north-western regions is disrupted largely due to unilateral diversion of the historical flow in the downstream area. It has become more pronounced from 1987 because from that period there is no agreement on water sharing between the countries which allowed the upstream country to divert as much water it wants. On the expert level it is believed that almost 91% of the Ganges flow have been diverted leaving only 9% for the lower riparian. Due to the decrease of surface water flow in this region by 85%, the irrigation is dependent on the ground water but that has also reached to the saturation point. The consolidated loss on different sectors for withdrawal of water of the Ganges is estimated to be about Tk. 3000 million per year.⁷⁸

C. On Socio-Political Life

Ganges issue always played an important role in socio-political life of Bangladesh. The fluctuating and decreasing river flow has not only disrupted the environment and economy of the south-western as well as north-western regions but also disrupted

77. *Ibid.*

78. Information received from a concerned expert in an interview.

the social stability there. Land degradation of millions of acres have made thousands of people unemployed. Apart from agriculture, industry, navigation, fisheries and various other sectors on which large number of people depend for their survival have also been affected very seriously. Growing food deficit, rising food prices, increasing unemployment as well as inflation are associated with the problem. The economy as a whole is deprived of the possibility to take a course of stable growth. To make problems worse, alternate flood and drought frequently render thousands of people homeless who are migrating towards the capitals as well as the cities of various districts. In Dhaka city alone about 7.5 million people live in slums.⁸⁰ These people create extra pressure on the scarce job market and help increase food prices. Being subject of social injustice and maltreatment they carry with them a feeling of antagonism against the source of their misfortune, i.e., the developmental activities undertaken by the neighbouring countries. This factor creates social unrest.

The issue has political implication too. Government's failure to resolve the problem with India is always a matter of public resentment. The politicians of Bangladesh, knowing very well the prevalence of this feeling among the general mass, tried to capitalize on this. Solution of Farakka barrage problem is one of the common issues in the political activities in Bangladesh. But the irony is that for the government in power, effort to solve the problem is constrained by Indian principled position of bilateral rather than regional and comprehensive approach. As a result anti-Indianism continues to grow among general mass which instead of solving the problem further complicates it.

Another side of the picture is that for any government in power in Bangladesh, Farakka Barrage issue is most sensitive in

79. Manirul Qader Mirza, *Robbar*, September 3, p. 23.

80. For details see Khurshida Begum, *op. cit.*, p. 234.

her relationship with India. Since the amount of water of Ganges to be flown in Bangladesh is absolutely within the control of the upper riparian i.e. India, it gives her a leverage over Bangladesh. Thus Bangladesh has to formulate her policy very cautiously. The water sharing problem made Bangladesh very much vulnerable which in turn provides the imperatives for her to live with India rather than annoying her. It may be noted in this context that whatever achievement regarding water sharing has so far been made was possible only when good relationship between the two countries prevailed.⁸¹ It is, therefore, in the interest of Bangladesh to maintain good neighbourly relation with India.

CONCLUDING REMARKS

The contention over Ganges issue between the two neighbouring states of India and Bangladesh has reached a delicate state because both being poor and underdeveloped are facing the challenge to feed their growing population and to keep pace with the development in other sectors. But the degree as to how crucial it is in each case, varies. India's endeavour to take some calculated steps with a view to serve her own need is posing severe threat to Bangladesh including disturbance in the balance of nature. Bangladesh is geographically in the disadvantaged position which forced her to bear almost the sole burden of that disturbance in such a helpless way that her survival is at stake. The disputes on the Ganges as well as all the other common rivers between the two countries are to be viewed in the context of implications for the socio-economic and environmental equilibrium. The political aspect of the problem has made it more and more complicated.⁸² The political primacy need to be stressed while there is no denying that if political goodwill prevails on both sides a mutually acceptable solution can be achieved. The need for a regional or at least a bilateral approach can hardly be overstressed.

81. *Ibid.* p. 227.

82. *Ibid.*

The multifarious problems of conserving ecological balance viz, afforestation, flood control, proper use of common rivers, etc. can not be resolved in isolation from each other nor by any individual state alone. It should be realized by India that since the rivers of the region are part of the same ecological belt, developmental activities done in one part of the rivers are bound to cause repercussion in another. Every programme needs to be undertaken keeping in mind this ecological unity. Moreover, it is by now widely recognized that there is immense potentiality for development through cooperation in such areas as the unutilized energy reservoir of Nepal from which the entire region can be developed.

A jointly coordinated policy should be formulated for collaboration of the environment related organizations of the countries of the region and there should be exchange of materials and information among them. A regional coordinated body within or outside the South Asian Association for Regional Cooperation (SAARC) may be established for continued monitoring on the situation resulting from the environmental changes that are taking place. The objective of such coordinated policy should include things of regional priorities. It may be useful to jointly exercise the relative priority of flushing of Hooghly river, for example, as against the acute problem faced by Bangladesh due to diversion of water.

Steps should be taken to afforest Himalaya and for this purpose the upland countries should be provided with alternative energy source. This is again a regional problem and all concerned states need to formulate a joint comprehensive long term project for which external financial assistance may be obtained from appropriate sources.

Though regional cooperation is the most practical approach for development of common natural resources of this region and

resolution of most of the related problems including water sharing, Bangladesh should also recognize the fact that India, which has the upper hand, is yet to fully adopt this regional approach. Hence, it may be counter-productive to bank too much on a regional solution. Parallel with Bangladesh's efforts for a regional solution, Bangladesh also needs to strengthen its relation with India with a view to reaching a long term bilateral agreement with India for long term sharing of the common flows between the two countries. Besides, Bangladesh must also strengthen the national polity and economy, particularly, the relevant institutions in order to build up the resilience to minimize the negative impacts of the growing problem.