INTRODUCTION

In a predominantly agrarian economy like that of Bangladesh development of water resources constitutes an area of vital concern for the overall development of the country. About 85 percent of its people live in the rural areas while 80 percent are dependent, directly or indirectly, on agriculture.[1] The country is generally described as a delta or as a flat alluvial plain. The rivers are the most commonplace here and is very significant feature of the physical landscape of the country. It is criss-crossed by the major river systems, the Ganges, the Brahmaputra and the Meghna and their innumerable tributaries and distributaries. But the people of Bangladesh are faced with a paradox of excess of water when they don't need as much while there is a critical shortage of water when they need it most. An efficient management and for that matter a sound water resources development policy is, therefore, of vital importance to national development of Bangladesh.

But there are two sets of constraints for Bangladesh with regard to harnessing and utilization of her water resources : (a) domestic and (b) 'across-the-border'. While geophysical position, technical, financial and management capabilities are the key components of both the sets of constraints, political and riparian aspects are an added dimension of the second set. Most of the flows of the rivers of Bangladesh originate from outside the country. More than

1. Agriculture at present absorbs about 75 percent of the civilian labour force and contributes 50 percent of the GDP. See Bangladesh Bureau of Statistics, *Statistical Year Book of Bangladesh 1984-85* (Dhaka : BBS, 1985).

90 percent of their catchment areas remain outside Bangladesh, mostly in India. The control of Bangladesh, the lower riparian, over her water resources is, therefore, fragile.

This situation gives India an edge over Bangladesh. Furthermore, India's geostrategic calculations and attitude and policy toward her neighbours also influence India's water diplomacy vis-a-vis Bangladesh. It is reflected in her (1) bilateral approach toward basically a multiateral issue; (2) protracting the resolution of the problem on various pleas and at the same time gearing up her own water utilization in order to prepare the ground for demanding a greater share of the common waters; (3) opposition to cooperation offered by international agencies in water resources development; (4) an obsession in favour of shifting the thrust from sharing to augmentation making the former secondary to the latter in respect of priority of considerations etc.

A recent development is India's agreeing to jointly approach Nepal for co-riparian cooperation on the Ganges water and Nepal's readiness to do so. But, much would depend on the extent to which Nepal's involvement is sought and how expeditiously a solution is found and implemented. There remains the knotty problem of sharing of the augmented water, if any. Indian Minister for Irrigation is recorded to have stated that India and Bangladesh approached Nepal seeking only information and data to help augmentation of the Ganges flow but not hoping to include Nepal in the talks.[2] It remains to be seen how soon and to what extent the peoples of these countries get the benefits of the co-riparian cooperation in the river basin development and contribute —not only to the well-being of the peoples but also fostering of the SAARC spirit generated recently in South Asia.

Bangladesh, in the meantime, continues to be affected adversely by India's water diplomacy. The impact of increasing withdrawal in the upstream of the common flows and the diplomatic activities

2. *The New Nation*, 25 August 1986.

around them bring about certain far-reaching adverse consequences on Bangladesh. And such consequences continue to be caused by the withdrawal of water not only at Farakka and from the Teesta but also from other small rivers that enter Bangladesh at several points. The problems of small rivers may not be coming to the fore-front because of priority and scale of problems. But it is apprehended that the cumulative impact on Bangladesh of these localised problems may assume larger dimension in not too distant future.

It, therefore, appears worthwhile to undertake a study on the problems relating to the common water resources between Bangladesh and India. The present paper is an attempt in that direction.

The paper contains five sections. The first shows the geopotitical setting and hydrological situation of Bangladesh. The second section deals with India's water diplomacy with Bangladesh. The third section offers a glimpse of the legal issues, while the fourth gives an account of the impact of upstream activities and diplomatic postures of India vis-a-vis Bangladesh. Finally, the paper makes an attempt to offer certain options for Bangladesh to evolve a strategy for a comprehensive development of her water resources.

GEOPOLITICAL SETTING OF INTERNATIONAL WATER COURSES BETWEEN BANGLADESH AND INDIA

Bangladesh, mainly a flood plain containing a combined delta of the Ganges, Brahmaputra and the Meghna, is bounded on the West North and East by India, on the Southeast by Burma and South by the Bay of Bengal.[3] With an area of 143,998 square kilometers and over 100 million people (1985), Bangladesh is one of the largest deltas of the world. Its geographical setting and hydrological situation is extremely difficult for the control and development of its water resources.

3. Except 174 miles of common border with Burma and 455 miles of sea board, the rest of the border of about 2309 miles lies with India.

Due to the location of the great Himalayas on the North and the Bay of Bengal on the South the country is characterized by an effective monsoon climate. The rainfall is a significant component of the water cycle and water resource development in Bangladesh. But the distribution of rain water is highly skewed both spatially and seasonally. The mean annual rainfall increases towards North-east of the country and reaches to about 5690 mm at Lallakhal, at the extreme North-east corner of Sylhet. Rainfall starts decreasing towards West and is reduced to about 1,110 mm at Chapai Nowabganj.[4] The seasonal variation shows that about 80 percent of the rainfall occurs during 5 months period of monsoon starting usually from June and ending in October. During this period water surplus is experienced all over the country. In some places, although the month of May records water surplus and in some areas it is experienced even in October, the dry season which infact extends over seven months, is heavily defficient in water and soil moisture. The average annual water defficiency is over 15 cm in the extreme West to about 5 cm in the East.[5] The situation is further aggravated by the fact that the defficiency of soil moisture exists for about eight months (October-May) in the Western part and for five to six months (November-April) in the East.[6] Water resources development in Bangladesh is, therefore, oriented towards solving the dry season water defficiency by using mainly the surface water flows.

Beside rainfall, the surface water flows, a large and complex network of rivers, are a vital resource of Bangladesh. All these rivers total at least 24,000 kilometers in length and cover about 3.4 million acres of land or in other words, 9.7 percent of the country's total

4. Harun or Rasheed, *Geography of Bangladesh* (Dhaka: University Press Ltd. 1977), p. 103

5. F. Karim Khan and M. Aminul Islam, "Water Balance of East Pakistan", *The Oriental Geographer*, Vol. X, No. 1, (January 1966); also see M. Aminul Islam, et. al. (eds.), *Bangladesh in Maps* (Dhaka : University of Dhaka, 1981), plates 23 & 24.

6. *Ibid.*, pp. 2-6.

area.[7] Bangladesh, in fact, is cut through by these countless water courses, big and small, straight and twisty and dotted over with numerous beels and swamps. The whole range of economic, social and cultural life in Bangladesh have emanated from and are sustained by the historic uninterrupted flows of these rivers since time immemorial. Although, modern technology opened up an unprecedented opportunity to harness these resources, the potentials are constrained by inevitable political process. The state boundary between the countries that evolved through political process does not follow the logic of physical geography. There are at least 54 rivers in Bangladesh including the three major river systems—the Ganges, the Brahmaputra and the Meghna, whose head waters are located outside its territory and Bangladesh, being a lower riparian country, has hardly any control over them.[8] Most of the rivers are either their tributaries or distributaries except the rivers of South-eastern part of the country—the Karnafuli, the Sangu and the Matamuhuri.

Like rainfall, river flows are also seasonally variable. On an annual basis more water enters Bangladesh then can ever be used effectively. Of the total available water (1285 maf) in the country throughout the year, 84 percent comes as surface flow through major rivers. But the annual picture shows a considerable seasonal variation. The total flow through the major rivers varies from 2,46,050 cfs in February to 35,70,000 cfs in August (under 1983 water use conditions)[9]; which means the maximum monthly flow in August is at least 15 times more than the minimum flow in February. During the dry winter months the flows in the major rivers fall down drastically and most of the small rivers dry up.

7. Calculated from *Statistical Year Book of Bangladesh, 1985.* (Dhaka : Bangladesh Bureau of Statistics, Government of Bangladesh, 1985).
8. The three main rivers together drain an area of about 15,54,000 sq. km of which less than 10 percent lies in Bangladesh, for details see Nurul Islam Nazem, "Water Researces Development in Bangladesh", *biiss Journal*, Vol. 3, No. 1. (1982).
9. M. Shahjahan, "Surface and Ground Water Assessment, Development and Utilization in Bangladesh" A memeograph, 1985, p. 43

The situation of availability of water in Bangladesh is therefore unique in its nature and characteristics. There are a few perennial rivers which flow all the year round. Most of the rivers are intermittent, which flow during part of the year. There are even some rivers which are ephemeral in nature. The Ganges, the Brahmaputra, the Meghna, the Teesta and the Karnafuli are perennial flows. The catchment areas of perennial rivers, particularly that of the Ganges and the Brahmaputra is spread over several countries. The Ganges over China, Nepal, India and Bangladesh; the Brahmaputra over China, Bhutan, India, and Bangladesh and the Meghna over India and Bangladesh. The Ganges has an annual run off at Hardinge Bridge of about 432 maf while the Brahmaputra at Bahadurabad has 560 maf. The Meghna, an outfall of the Barak river (in India) has an annual run off of 90 maf at Bhairab Bazar.[10] It is to be noted here that the inflow of waters from India constitute about 92 percent of the total surface flow, while only about 8 percent is generated within the country

Perennial rivers, the Ganges, the Brahmaputra and the Meghna together carry about 85 percent of the dry season flows in Bangladesh. The primary surface water development potential in the country, therefore, remains with the perennial or main rivers. Of the total average dry season inflow in the country, the river Brahmaputra alone contributes 65 percent and the Ganges 15 percent. The Meghna and other small rivers contribute the remaining 20 percent of the dry season flow.[11] The largest three rivers together with their tributaries and distributaries in the country occupy about 80 percent of the total land area. All these rivers including the other inland channels and streams present an intricate web of river network across the whole country. Most of the rivers directly enter into

10. Hamidur Rahman Khan, "Water Resources Development in Bangladesh: Problems and Prospects", Paper presented at a *Regional Symposium on Water Resources Policy in Agro-Socio-Economic Development*, Dhaka, 4-8 August 1985.

11. M. Shahjahan, (1985), *op. cit.*

the Bangladesh territory across the border and some of them form border line between India and Bangladesh before entering into its territory (Annexure D.) The Ganges, the Muhuri, the Khowai, the Feni etc., for example, are bordering rivers. There are few rivers which, originating in India, enter into the Bangladesh territory and after flowing some distance re-enter into India. The rivers Bhairab and the Mathabhanga may be cited as examples. There are still other rivers which have double entry into the Bangladesh territory. The examples are the Manu, the Kodalia etc. All these rivers are in an active stage of siltation and, therefore, localised physiographic changes keep taking place either by erosion and/or by deposition every year.

The flat topography of Bangladesh, although ideal for agriculture is prone to frequent flooding in the wet season and shortage of water in the dry under the prevailing rainfall pattern and river regimes. Most of the areas of the country lie less than 20 meters above mean sea level. However, regional variations[12] are also found in its hydrological characteristics as well as in its relief pattern.

The North-west region of the country has a slope from the North to the South with an elevation from about 12 meters above sea level at Pabna to about 90 meters in Panchagarh area of Dinajpur. This region is prone to low rainfall and high water defficiency. In the driest month (February) on the average 361 m^3/sec of waters are available through stream flows in the region of which 347 m^3/sec flow from India into the region. In July the average flow rises upto 5,580 m^3/sec. The available static water in the region is estimated about 167 Mm^3.[13] The major contributors of water flows in this region are the Teesta (33 percent), the Dudhkumar (30 percent) and the Dharla (18 percent). The other rivers have some insignificant contribution to the total flows of the region.

12. Five hydrological regions have been identified on the basis of the characteristics of rivers, intensity of flooding, salinity condition etc. These are North-west, North-east, South-West, South-central and South-east rigions. See Anexure A, B, C & Fig. 2.
13. M. Shahjahan, *op. cit.*, p. 6.

The North-east region is dominated by the Meghna depression, more commonly refered to as Sylhet basin. Its elevation ranges from 3 to 6 meters above the sea level. The area is influenced by the back water effects of the river Ganges. Mean monthly inflow into the region in the driest month (February) is only 45 m^3/sec, while in July the mean inflow rises to 16,800 m^3/sec. In the driest month the Manu-Kushiara contributes 52 percent, Surma 19 percent, the Dhaleshwari 13 percent and the old Brahmaputra about 12 percent. The smaller rivers of this region along the north eastern and eastern border frequently carry flash floods during the monsoon and early monsoon. Most of the rivers of this region originate from the areas of greater rainfall intensity like the hills of Assam, Tripura and Meghalaya.

The South-west region is more complicated by its low gradient, poor relief and salinity condition. The rivers of this region for example, the Ichamati, the Gorai-Madhumati, the Passur-Rupsha, and numerous other rivers in the Sundarbans are characterized by cross-channels and they usually form loop. They flow North to South taking off from the main river the Ganges and carry enormous amount of silt. Any shortage of water in the Ganges, therefore, affects the whole region. These rivers are also important for inland navigation. Mean monthly stream flow varies from 190 m^3/sec in March to 7650 m^3/sec in August in this region. The Gorai-Madhumati, the most significant water course of the region, contribute about 60 percent of the surface flows in the driest month (March). In fact, the spill over channels from the Ganges form the main rivers in the South-west region. Intrusion of saline water through estuaries and by seepage is an inharent problem of this region. South-central region, on the other hand, receives enormous volume of water from the combined flow of the Ganges, the Brahmaputra and the Meghna through the river Tetulia, the Bishkhali, the Buriswar and the Arial-khan. The level of salinity concentration is also low in this region.

The South-east region is geographically different from the rest of the counrty, having generally elevated relief and being indepen-

dent in terms of hydrological response from the major rivers. The rivers of this region namely the Karnafuli, the Muhuri, the Sangu, the Feni etc. are mainly non deltaic in nature. They originate in the hill ranges of Tripura and Assam and drains directly to the Bay of Bengal. Karnafuli is the largest of these rivers which provides 87 percent of the stream flow of the region during the driest month. The other major flows are the Gumti (3 percent), the Feni (2 percent), the Sangu (2 percent) and the Matamuhuri (2 percent).

It is apparent from the above discussion that in the dry winter months there is a tremendous shortage of water in Bangladesh. In the monsoon period, an enormous volume of water is available in the country both from the rain and rivers. But due to poor drainage conditions of the river channels, an uncoordinated effort to management of water resources and upstream unilateral control of waters by India, Bangladesh incurs a great loss every year. The deltaic nature and smallness of the territory of Bangladesh, disadvantageous spread of her borders with India, lower riparian position of Bangladesh, upper riparian position of India, higher level of development of India and her expertise in water harnessing are some of the factors that contribute to India's water diplomacy with Bangladesh.

INDIA'S WATER DIPLOMACY

It appears from the foregoing that the geographical setting and hydrological situation of Bangladesh vis-a-vis India physically places the latter in an advantageous position over the former. This, together with India's geo-strategic calculations and attitude shapes her policy towards Bangladesh. As a result of the increasing upstream withdrawal of water by India, the share of water left for Bangladesh has been found to be progressively inadequate to meet her minimum needs during the dry season. This has given rise to manifold problems now facing Bangladesh. The pursuance, by various means, of the perceived national interests by a co-riparian of common river flows without due consideration of the rightful

share and interests of other co-riparian(s) is evidently at the root of this problem. This may be viewed as the negative aspect of water diplomacy. In contrast to this, a positive water diplomacy would imply that the co-riparians pursue, by various means, to establish the rights and interests in the uses of the common water resources by them and cooperate on common water resources with a view to maximizing benefits.

India appears to have pursued a water diplomacy that proved to be detrimental to Bangladesh's interests. It has taken up an ambitious plan for constructing some 54 barrages, storage dams and other multipurpose projects for utilizing the existing water resources of the Ganges, the Brahmaputra and the Meghna basins, of which 38 projects have been marked for the Ganges basin only.[14] India aims at attaining a total capacity of 63.2 maf of waters in the Ganges basin[15]. Apart from its projects in the Ganges it has also selected some 17 sites for erecting storage dams on the rivers Brahmaputra and the Meghna. If all these projects are completed the total storage capacity will be 120 maf. Many of these projects are already completed. Gandhi Sagar and Rana Pratap Sagar on the river Chambal, Matatila over the Jamuna river, Rihand and Sone over the Sone river and Farakka and Jangipur barrage on the Ganges are few examples of such projects. Apart from these a number of other projects are either under construction, investigation or under feasibility studies.

The River Ganges and Farakka

The most conspicuous among the problems now facing Bangladesh relates to the sharing of the waters of the Ganges. Ever since the Farakka barrage has been erected the total flow of water in the Ganges has fallen drastically, much to the detriment of the interest of Bangladesh. Farakka is situated on the section of the Ganges between Rajmahal and Bhagwangolla in the Murshidabad district

14. *The Bangladesh Times*, 12 April 1976.
15. *Ibid*.

Indo-Bangladesh border. The Indian Government conceived of of West Bengal and only about 18 kilometers upstream of the a barrage on the Ganges at Farakka for the preservation of the Bhagirathi - Hoogly river and the port of Calcutta. With this, a number of incidental benefits would also accrue, for instance, the improvement of city (Calcutta) water supply and drainage system of the region and improvement of the inland navigation, etc.[16] India proposes to withdraw 40,000 cusecs of water from the Ganges at Farakka through a 43 kilometers long feeder canal into the Bhagirathi-Hoogly for the maintenance of the Calcutta port, although the Indian Planning Commission had originally approved the project with the proposed withdrawal of only 20,000 cusecs.[17] The project also envisages that the barrage across the Ganges will provide a rail-cum-road bridge and a cross regulator across the Bhagirathi at Jangipur above the outfall of the canal.[18]

It however seems that navigating the Calcutta Port is not the only thing that hovered in the minds of the Indian strategists while planning the barrage. By certain reliable estimates the Farakka barrage has little positive impacts on the Calcutta port.[19] The other possible purposes of the barrage are to control the Ganges water to irrigate the Indian states of UP and Bihar. It is evident from a significant development of India in the field of irrigation since 1960s. In 1950-51 the gross irrigated area was 22.6 million hectares. By 1979-80 the figure had risen to over 50 million hectares.[20] But more important factor which the barrage offers to India is a political leverage in her dealings with Bangladesh.

Anticipating the adverse effects on the lower riparian the then Government of Pakistan formally protested against the Indian design

16. Government of India, *India 1970*, Research and Reference Division Ministry of Information and Broadcasting, p. 292
17. Z.A. Khan (ed.), *Basic Documents on Farakka Conspiracy (1951-1976)*, (Dhaka : Khoshroz Kitab Mahal), pp. 66-67
18. *Ibid.*
19. Md. Shah Alam, "Farakka Barrage : Laws and Politics", *Biiss Journal*, Vol. 4, No. 4 (1983), p. 157; and *The Daily Ittefaq*, 10 September 1986.
20. Nandita Bhatnagar, "Development of Water Resources in South Asia," *Biiss Journal*, Vol. 6, No. 3 (1985), p. 305.

of the Farakka barrage in the year 1951. India's first reaction to this protest was that the apprehnsions of Pakistan were fully hypothetical and the design was only at the planning stage.[21] However, India went ahead with her own plan, constructed the barrage on the Ganges at Farakka and finally commissioned it in 1975. According to the stated objectives, India diverts 1130 cumecs of silt free Ganges waters for the purpose of flushing the silt of the Hoogly river for the preservation of the Calcutta Port.[22] The upstream uses are further geared up in recent years by sanctioning large scale irrigation projects without considering the needs of Bangladesh.

As a matter of fact, the genesis of the problem lies in the wide seasonal variation of the Ganges flow. While for most of the year the average discharge of about 100,000 cusecs is more than sufficient, the lean period poses difficulty in meeting the requirements of both Bangladesh and India. Since the Farakka project is conceived as a means of diverting 40,000 cusecs of water from the Ganges into the Bhagirathi-Hoogly, it leaves only 15,000 cusecs of the Ganges flow for Bangladesh in the leanest period. In Bangladesh, the South-west region is entirely dependent on the Ganges water for its development. The most economic way of irrigating this region is by gravity diversion of the Ganges water. But the drastic reduction of the dry season flow of the Ganges due to upstream diversion by India jeopardizes Bangladesh's own water development projects in the region. The sharing of the Ganges water at Farakka to meet the requirements of both the riparian countries has, therefore, been a longstanding irritant in the relations between India and Bangladesh.

Negotiations have been taking place for over three decades between the Governments of Pakistan and India and since 1971 between Bangladesh and India, for a reasonable solution to the problem.

21. Z.A. Khan, *op. cit.*, p. 171.
22. Government of Bangladesh, "Updated Bangladesh Proposal for Augmentation of the Dry Season Flows of the Ganges" Vol. 1, (Dhaka: Ministry of Agriculture, Irrigation, Water Development and Flood Control, 1983), pp. 1-2.

Prior to 1971 the dialogue between Pakistan and India took place for ten times, five of which were at the Secretary level. But all this ended in a fiasco.[23] It was so because of at least two reasons : one, India lacked sincerity while carrying on negotiations with Pakistan as is evidenced by the fact that India never stopped working on the Farakka barrage project. Two, the failure of the authority in Pakistan to raise the issue at the political level with India. And that too was due to insincerity of the then central authority in Pakistan. In the case of the Indus river water problem, Pakistan was on the brink of waging a war against India which subsequently compelled the latter to come to terms with the former and that too with involvement of a third party—the World Bank. But in the case of the Ganges water issue Pakistan made several half-hearted attempts which neither could compel nor convince India to reach a mutually acceptable solution to the problem. As a matter of fact, India has always asserted the bilateral nature of the problem and her policy was to present Pakistan and later Bangladesh with a *fait accompli* in having constructed the barrage on the Ganges at Farakka.

Indian Diplomacy 1971 Onward

After the independence of Bangladesh in 1971 the whole gamut of the Indo-Bangladesh water problems was brought under the aegis of the Joint Rivers Commission (JRC), set up in 1972, to ensure the most effective joint efforts in maximizing the benefits from their common rivers.[24] The Commission held its first meeting in June of the same year primarily to discuss the problem of floods. The question of sharing waters of the common rivers between the two countries was kept out of the purview of the Commission. The question of apportionment of the Ganges water was, therefore,

23. See for details B. M. Abbas A. T., "Agreement on the Ganges" paper presented at the *Regional Symposium on Water Resources Policy in Agro-Socio-Economic Development*, Dhaka : 4-8 August, 1985.

24. Indo-Bangladesh Joint Rivers Commission, *Record of Disscussions of Indo-Bangladesh Joint Rivers Commission* (Dhaka: May 1985), Article 4,-p.iii.

referred to the concerned ministerial meeting held in New Delhi in July 1973 in which it was agreed that a mutually acceptable solution would be arrived at before operating the Farakka barrage project.

After the summit meeting in May 1974, the Prime Ministers of Bangladesh and India expressed a concerted view that during the dry months there might not be enough water in the Ganges to meet the needs of the Calcutta port and full requirements of Bangladesh, and therefore, the fair-weather flow of the Ganges in the lean months would have to be augmented to meet the requirements.[25] It was also agreed that before Farakka barrage was commissioned, a mutually acceptable allocation of the water available during the period of minimum flow in the Ganges would be arrived at. Since then the JRC has been trying to find out the best possible means of augmenting the dry season flow in the Ganges. In the meantime, India, wanted to commission the Farakka barrage. While negotiations were going on for sharing the Ganges flow, India proposed to test the feeder canal of the Farakka barrage. As a gesture of goodwill and good neighbourliness, Bangladesh agreed to the proposal but insisted that as the purpose was to test the feeder canal only, a limited amount of water be diverted. With this understanding an agreement on sharing of waters was signed in April 1975 at a ministerial level meeting in Dhaka. This agreement allocated 11,000-16,000 cusecs of water for India from 21 April to 31 May (41 days) 1975.[26] Bangladesh accepted the allocation of the remaining 44,000-49,000 cusecs of water sacrificing its original demands for 55,000 cusecs.[27] But India continued to withdraw the full quantity at Farakka beyond the period specified in the ageement which created a critical situation for Bangladesh. India began to withdraw unilaterally 40,000 cusecs of water at Farakka. Moreover, the change of government in Bangladesh in August 1975 caused Mrs Gandhi's displeasure and India's attitude towards the new government at

25. B. M. Abbas A. T., *op. cit.*, (1985).
26. Government of Bangladesh, *op. cit.*, (1983).
27. *Ibid.*

Dhaka was hardened. Bangladesh even failed to convince India to come to the negotiating table.

Under the cercumstances, Bangladesh decided to internationalize the issue at the Islamic Foreign Ministers Conference (May 1976), Nonaligned summit at Colombo (August 1976) and in the UN General Assembly (November 1976). The UN General Assembly decided to include the item titled "Situation Arising out of the Unilateral Withdrawal of the Ganges Waters at Farakka" in the agenda of its 31st session and allocated it to the Special Political Committee.[28] India challenged Bangladesh's move to interantionalize the matter and contended that the issue was purely bilateral. India also alleged that because of lack of cooperation on the part of the government of Bangladesh, India had no option but to continue withdraw water in accordance with the 1975 agreement although there was no provision for any withdrawal beyond May 31, 1975. India, however, agreed to meet urgently at Dhaka at Ministerial level for negotiation with a view to arriving at a fair and expeditious settlement.[29] The talks at last were resumed between the two countries in December 1976 and continued till January 1977, but there was no agreement at these meetings.

The defeat of Mrs Gandhi and her party in the Parliamentary Elections in March 1977 and a new (Janata) Government in Delhi paved the way for 1977 agreement for sharing the Ganges water. The agreement provided for a short-term arrangement for sharing the waters of the Ganges at Farakka and a long term arrangement for augmenting dry season flows. 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 allocation was fixed on the basis of flows reaching at Farakka based on 75 percent availability calculated from the recorded flows of the Ganges at Farakka from 1948 to 1973.

28. B. M. Abbas A. T., *op. cit.*, (1985), p. 12.
29. *Ibid.*, p. 13.

The agreement also stipulated that if the availability of water at Farakka during 10-day period is higher or lower than the amount shown in the agreement, it shall be shared in the proportion applicable to the period, provided that if during a particular 10-day period the flows at Farakka came down to such a level that the share of Bangladesh was lower than 80 percent of stipulated share, the release to Bangladesh during that 10-day period shall not be below 80 percent of the quantum shown in the agreement.[30] This agreement laid down the principle of sharing the waters of an international river. It also recognized the need for development of the water resources of the Ganges basin in cooperation with all co-riparian countries.

The 1977 agreement on sharing the Ganges water expired in November 1982. Before its expiry, the governments of Bangladesh and India signed a Memorandum of Understanding (MOU) in October 1982 to provide for the sharing of the Ganges waters for the next two dry seasons instead of a renewal of the 1977 agreement. The leaders of the two countries recognized that the 1977 agreement had not proved suitable for finding satisfactory and durable solution and that with its termination fresh efforts were necessary to arrive at a suitable solution. They also recognized that the main problem lies with an inadequate flow of waters in the lean season in the Ganges which imposed sacrifices on both countries. The reason for which the 1977 agreement was not renewed is simple. The MOU, although signed on the basis of 1977 agreement, is a significant departure in its terms and conditions of sharing by excluding the 80 percent guarantee clause for Bangladesh's share in case of abnormally low flows at Farakka from the provision provided in the earlier agreement. The delition of the 80 perecent guarantee clause in 1982 MOU struck at the very basis of sharing and allowed India to withdraw any amount or all the waters from the Ganges upstream of Farakka. It also retained with some modifications in the figures of availability of water at Farakka during different 10-day periods as well as the shares

30. *Ibid.*, p. 16

of the two countires. The MOU was again extended for another three seasons on its expiry in May 1984 under the same terms and conditions.

Inspite of repeated requests of Bangladesh for renewing the arrangements of sharing on a long-term basis India did not agree to it; rather, continues to insist on the need for some progress on the proposal for the augmentation of the Ganges dry season flow for a long term solution.

Augmentation of the dry Season Ganges Flows

In pursuance of the provisions of the 1977 agreement both Bangladesh and India came up with a proposal each for augmenting the Ganges flows during the dry months of the year. Keeping in view the surplus water in the Ganges basin during the monsoon period, Bangladesh proposal included construction of a number of water reservoirs in Nepal which could augment the Ganges flows in the dry winter months. On the other hand, India offered a link canal proposal linking the Brahmaputra, which carries a discharge in excess of the present-day requirements of India and Bangladesh, with the Ganges a little upstream of Farakka. The proposals were rejected by each other. Bangladesh rejected the Indian proposal on the grounds 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. Above all, both the ends of the link canal will lie within the territory of India, a proposition hardly acceptable to Bangladesh for obvious reasons. 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 a third party, in our case, Nepal.

However due to the change in leadership in New Delhi, there was a climate of understanding in the highest political level which made its manifestation first at the Bahamas and later in New Delhi in the year 1985 when meetings took place between President Ershad and Prime Minister Rajiv Gandhi. The climate further brightened at the first SAARC Summit in December 1985. Back home from the summit

at Dhaka, Rajiv Gandhi made it known that India was willing to make a joint approach to Nepal for its cooperation in the development of the common water resources. Bangladesh hailed the Indian move and a couple of Joint Committee of Experts (JCE) meetings followed in New Delhi and Dhaka. Subsequently it became known that both Bangladesh and India jointly approached Nepal for her co-operation and after due consideration Nepal expressed her readinesss for the same. But after the JCE meeting held in Dhaka in August 1986 the Indian Minister of Irrigation is recorded to have stated that the approach made to Nepal was to seek the necessary information and data and not to include her in the water development talks.[31] This naturally shocked those concerned and also created suspicion about the sincerity of India's intentions. It seems that India has never been sincere in her dealings with Bangladesh in respect of the water problem as a whole between the two countries and augmentation in particular. As a matter of fact, the need of sharing and augmenting the flows is not as pressing on India as it is on Bangladesh. So, the more time lapsed, the graver the consequences for Bangladesh. And on the other hand, India, in the meantime, can increase her own water utilization so that she could place a greater demand of the common waters depriving Bangladesh of the right of her uses of water. The latest spell of India's water diplomacy also speaks of the same.

India's Activities on the Brahmaputra and the Teesta

The Brahmaputra is one of the largest rivers of the world, with a length of some 2900 kilometers flowing through China, India, Bhutan and Bangladesh. Its drainage basin covers an area of 606,000 square kilometers within the territories of the above mentioned countries. Bangladesh is heavily dependent on the Brahmaputra for its agriculture, checking of salinity intrusion, its transport and navigation, fisheries and forestry and various other uses. The degree

31. The statement of Indian Minister of Irrigation, cited in the *Daily Ittefaq*, 2 September 1986.

and extent of dependence on the Brahmaputra is much greater than those of other rivers because of a large area covered by its basin. But the Indian water development activities on the Brahmaputra in the upstream pose a tremendous threat on the economy and ecology of the lower riparian Bangladesh.

India has adopted floodcontrol schemes on the Brahmaputra to reduce the flood hazards and damages. Such schemes involve 3830 kilometes of embankments along the main river's tributaries, 770 kilometers of drainage channels and 44 town protection projects.[32] Various river training programmes and channel improvement schemes have also been executed. In the field of irrigation, development of the Brahmaputra basin, India is still going on with minor irrigation works. The basin has cultivable area of 7.7 million acres of which 1.5 million acres are presently irrigated and about 4.2 million acres are potential for future irrigation.[33] Given the longterm and intensified irrigation programme of India in the basin, the total withdrawal fo water from the river by India will be about 50,000 to 60,000 cuseces.[34] So, it follows that the potential uses of the waters in Brahmaputra India will also cause damage to Bangladesh unless she becomes aware of it and takes necessary measures.

The Teesta is another mighty river on which the northern districts of Bangladesh are dependent. Realizing its importance for the purpose of irrigation construction of a barrage was started on the Teesta in 1958-59. The project was started with a view to irrigate 1.4 million acres of land and to protect 1.9 million acres from the perennial crop damage.[35] But in the Backdrop of India's recent construction of Gajaldoba barrage in the upstream of the Teesta, the Bangladesh

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32. Amjad H. Khan and Shahidullah Miah, "The Brahmaputra River Basin Development" in Munir Zaman, et. al. (eds.), *River Basin Development* (Dublin : Tycooly International Publishing Limited, 1983), p. 94.
33. *Ibid.*, p. 95.
34. *Ibid.*
35. *Holiday* (Dhaka), 4 April 1986.

project is under severe threat. Experts in the field believe that the construction of the Teesta barrage will be redundant if India commissions its Gajaldoba project. The Gajaldoba project will regulate the total flow of the Teesta and is likely to release water for Bangladesh consumption which would hardly be sufficient for less than one third of the proposed Teesta barrage command area.

The Gajaldoba project is likely to use the water of the Teesta for irrigation in the Mahananda and other river basins totally ignoring the Bangladesh interests. The only agreement on the sharing of the Teesta water, which allocated 36 percent of water for Bangladesh and 39 percent for India, has already expired.[36] So the Teesta has become another irritant in the Indo-Bangladesh relationship.

Small Rivers

Apart from the Ganges, the Brahmaputra and the Teesta, there are many more rivers which are either border or common rivers between Bangladesh and India. They are more than fifty in number. These small rivers constitute about 15 percent of the total surface water of Bangladesh. So the importance of these water courses for Bangladesh is also crucial. But water diplomacy by India has not been confined to the Ganges, the Brahmaputra and the Teesta, it is very much in practice in respect of other common water resources between Bangladesh and India. India has constructed various structures in its part of the common rivers for upstream withdrawal of water or for various other regulating measures.

India has constructed cross dams on the rivers Buri Teesta, Kherua, Sangli, and Ghoramara. She has constructed spurs and weirs on the rivers Kaljani, Dhalai, Katachara; blockage of the Sonai river; embankment on the Manu and Chiri; barrages over the Khowai, and Gumti and many other structures on many more common rivers. Due to these activities Bangladesh incurs a considerable damage in terms of life and property. Bangladesh faces flood and erosion

36. *Ibid.*

problem in the Kushiyara, Muhuri, Feni, Khowai, Ichhamati etc..[37]

The midstream of the river Kushiyara at Zakiganj demarcates the border between Bangladesh and India. On the left bank just opposite to Zakignj town is Karimganj town of India. The Kushiyara river is flowing a meandering course all through and Zakiganj is situated on the concave bank. The erosion problem of the river Kushiyara at Zakiganj has aggravated due to construction of a number of protective works by India on the left bank of the rivers since 1973-74. As a result, the deep water line has been shifting deep into Bangladesh side meaning a debate on the demarcation of international territory between the two countries. The problem was discussed at the 14th and 15th meetings of the JRC.[38] But the Government of India went ahead with the construction of many more protective works defying the JRC decision that pending the agreement none of the parties would undertake any work.

The water course of the river Muhuri has been shifted towards the right bank in Bangladesh side due to construction, extension and advancement of spurs and bank protection works along the left bank of the river in the Indian territory. A big char land of about 200 acres has been formed well within the Bangladesh territory and this char land is being cultivated by the Indian people.[39] When the matter was taken up by the concerned authority to the Indian counterpart, the Indian side did not even bother to reply the correspondences that Bangladesh made in the connection.[39a]

The midstream of the river Feni at Ramgarh forms the international boundary. The river Feni flows more or less straight in between Ramgarh town in Bangladesh and Sabrum town in India. But

37. Joint Rivers Commission (JRC), "Working Paper on Various Border/ Common Rivers' Problems between India and Bangladesh" Vol. I & II (Dhaka : July 1981)
38. *Ibid.* Vol. 2, (Tripura-Assam-Meghalaya Sector) pp. 1-2.
39. *Ibid.*, p. 6.
39a. See for example Joint River Commission, *Ibid.*, pp. 11-12.

due to the construction of spurs, there has been an erosion problem on the Bangladesh side. The problem was discussed at the JRC meetings but India encroached upon the river by constructing further works and diverting the flow to the Bangladesh side of the Feni river which is against the joint decision of the Joint Committee of Experts[40]. The same is applicable in case of the Ichamati, Gumti and Khowai rivers with addition that Bangladesh took up the Khowai river project with the hope of getting financial help of the Asian Development Bank (ADB).[41] But when the ADB made a reference to the Government of India on the project, the latter intimated the ADB about its plan for utilization of water in the upstream of the Khowai river in India. This resulted in defering of the project financing by the ADB till an understanding is reached between the Governments of Bangladesh and India on the availability of waters for the project.

The Torsa, the Jaldhaka and the Raidak are the rivers in India which feed the Dharla and the Dudkumar of Bangladesh. Any upstream development and decrease of annual quantum of waters to these rivers will greatly affect the Kurigram Irrigation and Flood Control Project in Bangladesh and depends on the waters of the Dharla and the Dudkumar. It has been reported that the Government of India has prepared a Master Plan for training the three rivers—the Torsa, the Jaldhaka and the Raidak[42] The resultant consequences for Bangladesh are only obvious.

The problems raised above have also become so acute that the JRC is considering the cases of six such minor rivers alongside the Ganges and the Teesta issues.

In the light of the above the nature of the Indian water diplmacy vis-a-vis Bangladesh may be characterized as follows :

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40. *Ibid.*, pp. 14-17
41. *Ibid.*, Vol. 1, (West Bengal Sector) pp. 10-12.
42. *Ibid.*

(1) India's basic approach in relation to her neighbours appears to centre on her own perceived national interests resulting in unilateral withdrawal of water by various means.

(2) In such a policy due regard is not paid to the interests of the neighbours and possibilities of development of the water resources through coriparian co-operation are left unexplored.

(3) India even influences the aid-giving agencies in case Bangladesh undertakes certain water development projects on her own and seeks aid from any outside donor country and agency.

(4) In the past India appears to have pursued a two-pronged policy in her water diplomacy. While negotiations were underway India went ahead with her own water development projects and opposed any such projects being undertaken by Bangladesh.

(5) India seemed to follow a policy of protracting the resolution of the problems on various pleas (delay in responding, not responding at all etc. etc.) and at the same time gearing up her own water utilization in order to prepare the ground for demanding a greater share of the common waters.

(6) Throughout more than three decades of negotiations India seemed to have followed a policy of *fait accompli* in many cases.

(7) The construction by India of various structural works on the Indian side of the border rivers serves as a protective measure for the Indian side, whereas it caused devastating effects on the Bangladesh side. Besides, the erosion on the Bangladesh side adversely affects Bangladesh interests in demarcation of the international boundary.

(8) In case of small rivers, India cut the choke points and blocked the water flows by constructing various structural works thereby depriving Bangladesh of her rightful share of the common waters.

Thus, India's water diplomacy has been a major instrument in pursuing her perceived national interests in the sector of water resources development without due regard to the rightful interests of her lower riparian, Bangladesh.

INDIA'S WATER DIPLOMACY AND INTERNATIONAL WATER RESOURCES LAW

Waters of international river basins are common resources of the co-riparian states. It necessitates certain acquaintance with the Law of International Water Resources in order to comprehend the problems of rights and obligations of the riparian(s) in the rational management of these vital resources. Present international law concerning water resources is the product of centuries of endeavour towards formulating a set of principles and procedural instruments to balance and harmonise divergent national interests.[43] International Water Resources Law has certainly not reached maturity. Nonetheless, it is equally clear that a number of basic principles and rules have achieved the status of legal norms[44] which are evident in certain doctrines, judicial decisions and state practice. The Indian water diplomacy is to be viewed through these norms of international law.

The Doctrinal Basis: The principles of international river law have drawn sustenance particularly from theories propounded by states and scholars from time to time. Two of the oldest theories in the field draw their inspiration from the concept of unlimited territorial

43. Dante A. Caponera, "International River Law", in Munir Zaman et. al. (eds.), *River Basin Development* (Dublin : Tycooly International Publishing Limited, 1983), p. 175.

44. R.D. Hayton, "The Law of International Water Resources Systems" in Munir Zaman et. al. (eds.), *River Basin Development* (Dublin : Tycooly International Publishing Limited, 1983), p. 197.

sovereignty and the doctrine of unlimited territorial integrity[45] The first theory was advanced and sustained obviously by upper basin countries, while the second by lower basin states.

These extreme theories provided doctrinal justifications for perceived national self-interest. In the present world, applications of the two doctrines mentioned would breed permanent conflict. And that is why, they have become a relic of the past giving way to the new concept of "reciptocity", recognizing the reciprocal rights and obligations of sovereign states in their relation to sharing of international water resources. These developments have generated a fresh set of principles[46] that tend to limit the exclusively nationalistic approach of the earlier theories on grounds of equity, fairness and peaceful relations.

The currently prevailing principles in international water law are, *inter alia*, equitable apportionment (or utilization)[47] and the prohibition of substantial injury or appreciable harm. The principle of equitable apportionment is concerned with accomplishing the distribution of the waters by achieving the maximum benefit for each co-riparian, consistent with minimum detriment to either. This principle provides the flexibility needed to accommodate different uses by several co-basin states. It is widely accepted and regarded as the very basis of a co-operative, development-oriented planning and management of international drainage basins. However, the practical application of this principle involves certain problems. It is not only because of its 'equity' nature, but also because the factors or considerations to be employed in the act or process of application have not been thoroughly or even properly clarified. In that regard,

45. See for details, K.A.A. Quamruddin, "Regional Cooperation in Water Resources Development" Paper presented at a Symposium on *Water Resurces Policy in Agro-Socio-Economic Development* (Dhaka : 4-6 August 1985), p. 6 ; and D.A. Caponera, *op. cit.*, p. 177.
46. D.A. Caponera, *op. cit.*
47. D.A. Caponera, *op. cit.*, pp. 179-180 ; 190-191 ; 207.

the provisions of the Helsinki Rules on the Uses of Waters of International Rivers of 1966 have not proved sufficiently helpful. A somewhat different approach may be in order, to facilitate determinations about equitable use in specific cases. However, this principle is implicitly embodied in interanational treaties and explicitly embodied in some interjurisdictional domestic treaties between states of the United States.

In view of the currently prevailing principles in international water law, it may be said that a state has the right to develop unitaterally that sections of the watercourse which traverses or borders its territory, insofar as such a development is not likely to cause substantial and lasting injury in the territory of another state or inconvenience incompatible with good neighbourly relations.[48] As a consequence where the injury is likely to be substantial and lasting, development works may be undertaken only subject to prior agreement.

It is difficult, however, to establish a criterion for distinguishing between minor and substantial injury. Only an appraisal of the injury inflicted in concrete cases can determine how substantial it is. Official records in Bangladesh show that appreciable harm was done to it by the increasing upstream withdrawal of water by India.[49]

The views of individual scholars and international legal experts appear relevant in this connection. For example, C. B. Bourne holds the view that a riparian has the legal right to utilize the water of an international river in its territory if its doing so causes no substantial injury to co-riparian states. So all major interference by a riparian state with the water of an international river within its territory that seriously affects the use and enjoyment of the same water system by co-riparian states having rightful shares is illegal.[50] This view is also shared by

48. *Ibid.*, p. 182.
49. *Ibid.*, p. 190.
50. C.B. Bourne, "The Right to Utilize the Waters of International Rivers" *Canadian Year Book of International Law*, Vol. 3, (1965), pp. 188-259.

other renowned authorities on international law like L. Oppenheim and J.L. Brierly.[51] This principle is amply recognized in customary international law regulating the rights of riparian states to use the segments of an international law regulating the rights of riparian states to use the segments of an international river flowing within their territories.

The Juridical Base: There is unanimity among judicial decisions that each riparian state has a rightful share and interest in the water of an international river which should be respected and taken into consideration by co-riparian states in utilizing water of the river in their territories. The juridical underpinning of these propositions was furnished by the Permanent Court of International Justice (PCIJ), when it stated that countries have a common legal right to the resources of a shared river, not just a right of passage, the essential characteristics being the 'community of interest' of all the parties in the use of river and exclusion of preferential privilege of any riparian state in relation to others.[52] There are also other examples of adjudications by international tribunals and arbitrations. Domestic courts have also lent a helping hand in this inevitable evolution of the law. These courts, particularly those of federal states, in their decisions concerning water disputes have invoked a variety of highly relevant courts. Precedents abound in the practice of the United States and India.[53]

State Practice : The law governing the utilization of water of international drainage basins has got its origin in treaties, conventions and declarations of states. There are more than two hundred bilateral and multilateral treaties and conventions signed between

51. L. Oppenheim, *International Law* (ed.), H. Lauterpacth, 8th edn. (Vol. 1 London : 1955), p. 475 ; and Brierly J. L. *The Law of Nations* (London : 1955), pp. 204-205.
52. Permanent Court of International Justice, Oder Case, 1929.
53. See for details, D.A. Caponera, *op. cit.;* pp. 179-182; M. Rafiqul Islam, "The Effects of Farakka Barrage on Bangladesh and International Law", *biiss Journal*, Vol. 5, No. 3, (1984) pp. 253-255.

and among different countries throughout the world. The Mexico-United States Convention and Treaty, the Rhine River Basin Treaty, the Egypt-Sudan Agreement on the Nile, the Lower Mekong Basin Treaty, the Indus Basin Treaty are some of the examples. Besides, article IV of the Helsinki Rules on the Uses of Waters of International Rivers of 1966 stipulates, "Each basin-state is entitled within its territory, to a reasonable and equitable share in the beneficial uses of the waters of an international drainage basin." There is also a widespread acknowledgement of the principle that riparian states are responsible for the effects of their use of common water on others.

So, there is a widespread acknowledgement of the principle that riparian states are responsible for the effects of their use of common waters on others. It may, however, be argued that treaty provisions themselves do not become binding on third parties. Surely, in the absence of clear treaty provisions, customary laws may often pose problems as to their interpretation and practical application. And since there is no universal convention laying down the concrete provisions aimed at solving innumerable delicate issues that might arise between the states in their uses of waters of the international rivers and since reference is always to be made to certain facts pointing to the matter of customary law-making, political manouvrings from the position of strength have sometimes been a sad reality.[54] Nevertheless, it is to be borne in mind that there is a general acceptance of treaties as a source of customary international law. The fact that in these treaties similar problems are resolved in similar ways make of these treaties and negotiations a persuassive evidence of law-creating international practice.[55] It may, therefore, be inferred that an obligatory principle of customary international

54. Md. Shah Alam, *op cit.*, pp. 152-53.

55. R.D. Hayton, "The Formation of the Customary Rules of International Drainage Basin Law", in Garretson, Hayton and Olmstead (eds.) *The Law of International Drainage Basins*, 1976, pp. 861-871; H.J. Berber, *Rivers in International Law*, 1959, pp. 128-156; M. Rafiqul Islam, *op. cit.*, pp. 256-257.

law has developed through these and similar treaty provisions.

So, according to international law India, as an upper riparian, has well-defined legal obligations towards Bangladesh, the lower riparian. But unfortunately, India is violating all the principles and rules governing the utilizations and development of international water resources in relation to Bangladesh and thereby seriously damaging the existing economy and potential development of Bangladesh. Hence, the water diplomacy pursued by India appears to be inconsistent with and repugnant to the existing principles and practice of law governing the utilization of international water resources.

IMPACT ON BANGLADESH

The rivers of Bangladesh are an indivisible component of life and living of its people. That is why the increasing withdrawal by India in the upstream of the common flows and her diplomatic activities around them bring to bear certain far-reaching adverse consequences on Bangladesh. Within one decade an abrupt change is marked on its physical features, natural environment, economy and social life of Bangladesh. This is possibly an outcome of activities in the upstream. The impact may be assessed from the following :

Floods : Floods and cyclones are nothing new in Bangladesh. It is an annual phenomenon here that inundates about one third of the country every year and may extend to over half of the country during severe flood. Due to geographical location, topography, climatic condition during the monsoon period the country is subject to huge amount of surface water inflow derived from both rainfall and run off from upper catchments.

Floods occur when the capacity of the river channels at any point is inadequate to carry off the abnormal quantity of water. The main sources of flooding in Bangladesh are spill from rivers, drainage congestion of local run off due to extremely flat nature of topography,

storm surge and tidal blockage.[56] A recent study shows that about 30 percent area of the country is subject to flood due to spill over from major rivers, while the floods from small rivers cover about 40 percent area of the country.[57] One-fourth of the country's total land is normally free from floods. The flooding depth usually ranges from 1 meter to 3 meters, although some low-lying areas are flooded upto a depth of 9 meters.

The North-east region of the country, which is dominated by the Meghna depression and low relief, is severely prone to flash floods from the rivers of hilly catchments. Since these rivers drain the areas of greater rainfall intensity, flood-peaks can be proportionately larger but of shorter duration and more destructive than of the main rivers.[58] High water levels in the river Meghna are controlled downstream by the Ganges flow during the flood season. Moreover, a significant back water effect through the Meghna basin lasts untill gradients are stabilised which allow drainage of the basin. Similar problems occur in the Atrai basin in North-west region. Low drainage capacity of the rivers in the South-west and South-central regions associated with high tidal range in the coast retard the rate of drainage into the Bay of Bengal. Flood causes damage to crops and property, disrupt communications, creates health and sanitation problems, causes loss of lives and brings untold suffering to the people in flood affected areas. According to a conservative estimate the damage due to floods is well over Tk. 6000 million a year on an

56. Md. N. Huda and J.U. Chowdhury, "Floods and Erosion", A Country Paper presented at a *Regional Conference on Floods and Erosion*, Dhaka : 7-10 September, 1986, p.9.

57. *ibid*.

58. Ainun Nishat, "Delay in Water Resources Cooperation : A Bangladeshi Perspective of Human Opportunity Costs", paper presented at a Conference on the *Opportunity Costs of Delay in Water Resources Cooperation between Nepal, India and Bangladesh in the Ganges and the Brahmaputra Basin*, Gold Coast City (Australia) : The Institute of Management Sciences Conference, XXVVII, 21-23 July 1986,

average (in terms of damages to crops and properties).[59] But loss of human life and other miseries cannot be equated with and quantified in terms of money. The flood damages are not only associated with the actual flooding but also from uncertainties connected with it. Floods in the principal rivers occur in monsoon with regularity in timing, duration and magnitude. More than 80 percent of the flood run off is brought from outside the country of which 90 percent is contributed by the major rivers.[60] The traditional agricultural practices are, therefore, compromised with flooding condition. Such compromise, however, adversely affects the practices of HYV. When the floods are abnormal damage to crops, loss of lives and other properties are generally severe.

Flood is considered as a problem this days, which in the past, was something to be tolerated. To minimise the loss caused by flood as has been explained earlier, a cooperative effort should be undertaken by the co-riparian states. It may be observed (Fig. 3) that in the recent years flood peak in the Ganges has gone up, possibly due to flood protection measure undertaken in the upstream.

Erosion and Siltation : The situation of flooding in the country is further aggravated by the factors of erosion and siltation. By the process of erosion and siltation the capacity of river channels is reduced and meandering increased. The major rivers carry about 2.4 billion tons of sediments annually resulting in gradual deterioration of morphological characteristics of the rivers.[60a] Increased siltation in the river bed and bank erosion have some lasting consequences, both in terms of current loss as well as further flooding and damages. The tendency of eroding banks and silting beds is quite high in case of both the Ganges and the Brahmaputra. The Ganges has been experiencing a severe morphological change in the downstream since

59. Manirul Qader Mirza, *Holiday*, 4 July, 1986.

60. Amjad H. Khan, "Floods : Problems and Prospects—A Regional Overview', Keynote Address on a Regional Conference on *Floods and Erosion*, *op. cit.*

60[a]. Manirul Qader Mirza, *op. cit.*

the commissioning of the Farakka barrage. 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 (Fig. 5).[61] 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. Migration of rivers due to erosion and sedimentation create manifold problems in boundary demarcation, irrigation projects, navigation, river training and so on.

Drought : Sufficient waters are required in the dry season for agriculture, domestic use, navigation and industrial purposes. But waters available in the dry season are not sufficient even for agriculture alone. Drought of varying intensity occurs in almost every year in most of the parts of Bangladesh during the dry winter months.[62] The drought situations are specially critical in its North-western and South-western parts. After cessation of monsoon rain (usually by October) occasional rainfalls 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 purched in the North-western part of the country. According to an estimate Bangladesh has incurred a loss of Tk.20711 million since 1975 due to withdrawal of Ganges water where agricultural sector is the worst hit. It accounts for 75 percent of the total loss.[63]

Salinity : Reduction of flows in the rivers and the variation of hydrologic conditions in the coastal areas cause intrusion of salinity from the Bay of Bengal through river channels as well as by seepage effect. The present salinity limit in the Meghna estuary is checked

61, The Bangladesh Times, 30 April 1985.
62. Ainun Nishat, *op. cit.*
63. Manirul Qader Mirza, *op. cit.*

and maintained by the combined flows of the Ganges, the Brahmaputra and the Meghna. Any reduction in the flows of these rivers leads to a sharp increase in salinity in the coastal areas. The salinity conditions in the coastal areas are being studied since 1976. The study shows that salinity intrusion, concentration and duration in the Sibsa-Pasur estuary in the Khulna region depends mostly upon the quantity and duration of the upstream flow received in the area from the Ganges through the Gorai-Madhumati system.[64] 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.

The salinity concentration lines of 500 micro mhos for different years show (Fig. 4) that the salinity is seriously affecting the South-west region, particularly the industrial city Khulna. In April 1983, the salinity level at Khulna had risen to 17,000 micro mhos.[65] To keep the salinity to a permissible limit (below 500 micro mhos) the minimum Ganges flow at Hardinge Bridge should be about 78,000 cfs, which is very close to pre-diversion average minimum flow in the Ganges.[66] Continuous increase in the salinity of water and its inland intrusion adversely affects agricultural production, industrial and domestic use and threatens the ecological balance in the area.

Navigation : Most of the rivers of the western part of the country are silted up and some of them dry up during the lean season which cause a great fluctuation in the total lengths of navigation route between dry and wet season. According to the Bangladesh Inland Water Transport Authority the wet season routes' length is about 8370 kilometers in the dry season.[67] Although the remotest parts of the country are quite easily and economically approachable by water ways, the gradual decreasing of waters in the rivers during the dry

64. Ainum Nishat, *op cit.*

65. *Ibid.*

66. A. Hannan, "Ganges Flow and Salinity Problem", *Bangladesh Journal of Water Resources*, Vol. 2, No. 1, (Dec. 1981), pp. 19-27.

67. Nurul Islam Nazem, *op. cii.*, p.79

months converted the water transport into a seasonal and restricted one. Particularly, some of the water ways are most seriously affected by the upstream diversion of water from the Ganges and the Brahmaputra river at different points. The ferry terminals at different busy road transactions have to be shifted during the low flow which costs millions of taka and unnecessary suffering of the traveller.

The *vegital cover* of Bangladesh is diminishing as a result of human activities like extraction of wood and clearing of forest for human habitation. Regeneration of forest is almost nil. The major vegital covers are being affected by the salinity of soil in the southern region. An adverse impact of overall deforestation on the environment has already been noticed in the country.

The *pollution* of the waters in the upstream has also become a threat to the environment, economy and the social life of Bangladesh. For example, out of the total length of 2500 kilometers a 600 kilometers-long stretch is feared to be worst polluted in the Indian part of the Ganges.[68] Apart from disposal of industrial waste and human pollution by the disposal of urban liquids, run off from the areas where the farmers extensively use insecticides and chemical fertilizers mix with the Ganges water and enter Bangladesh. The impact of water pollution in the rivers of Bangladesh has not yet been assessed properly.

POLICY OPTIONS FOR BANGLADESH

It is seen from the foregoing sections how crucial the development of water resources in Bangladesh is for its overall socio-economic development. It is, therefore, a pressing need for Bangladesh to evolve a sound water resources development strategy so as to be in tune with the objective of optimum utilization of the water resources for socio-economic development of the country.

As far as development options relating to water is concerned, according to experts, the options before Bangladesh are (i) autarkic

68. Link News Weekly, 26 January 1986, p. 65

water development, (ii) development of water resources in cooperation with co-riparian states, and (iii) a combination of both. As a matter of fact, the geographical setting and the hydrological situation of Bangladesh would suggest that her water development strategy should include co-riparian cooperation. Bangladesh should, therefore, pursue a water diplomacy with the emphasis on coriparian cooperation for the development of the water resources with a view to maximizing the benefits of the peoples of the co-riparian countries.

Bangladesh's Water Diplomacy

Bangladesh has consistently been making efforts to make India recognize the adverse effects on Bangladesh as a result of the upstream withdrawal of international river waters so that the two could agree to a reasonable and equitable apportionment of the water resources. In Bangladesh perception, given cooperation of the co-riparians, the water resources in the region offer immense possibilities of development. For this purpose, Bangladesh has stressed the need for including Nepal in such cooperative efforts in developing the water resources of the Ganges. It is, indeed, encouraging that India has since agreed to Nepal's participation and when both India and Bangladesh approached Nepal in this regard Nepal's response was positive.

In the light of foregoing analysis, the water diplomacy to be pursued by Bangladesh should form a part of her strategy for a comprehensive water resources development policy including the following elements :

i) As far as the bilateral aspect of water diplomacy is concerned, Bangladesh efforts should be directed to the signing of a longterm agreement on the subject with India in order to ensure a longterm sharing of the common flows between the two countries. The object is to ensure that India plans its future water utilization in a manner not detrimental to Bangladesh interests.

ii) In respect of the water of the Ganges Bangladesh's aim should be the cooperative river basin development with the participation of both India and Nepal. A basin approach is to be persistently pursued by Bangladesh chiefly for two reasons : (a) a comprehensive development of water resources of transfrontier water courses is likely to prove most beneficiary if all the co-riparian states of a river system participate in it; and (b) relations between and among nations may not always be governed by rational considerations. A basin approach by all co-riparian states will create a balanced interdependence among them, thus creating a climate conducive to similar cooperation in other areas.

iii) In pursuance of the JRC and for that matter the JCE activities, the question of small rivers should receive due attention without delay. As in the case of the Ganges waters Bangladesh policy should be to step up efforts to reach a fair, equitable and speedy agreement with India in regard to all of these rivers and involving the cooperation of all the co-riparians in their development.

iv) Although sharing of the common flows is essential, their augmentation is an important component in the water resources development. Augmentation is an integral in a co-riparian cooperation where the availability of water is conditioned by the hydrological realities. Thus, strategy should be to pursue both sharing and augmentation simultaneously.

v) The Ganges issue is the most protracted and hence the most pressing of all common water courses between Bangladesh and India. Most of the efforts of Bangladesh are, therefore, geared in the direction of devising a mutually acceptable solution to the problem. Even after a formal joint approach of Bangladesh and India to Nepal seeking its cooperation in the development of the water resources common to all the three, the Indian Minister for Irrigation is reported to have indicated that the said joint approach to Nepal was just to seek information and data, and not to include Nepal in the water resources development talks. Nevertheless, it would be consistent

with the spirit of SAARC and also logical for Bangladesh to pursue her efforts to have Nepal included as a partner in cooperation for the development of water resources of the Ganges basin. This is because, harnessing and management of a river basin connotes investigation, rational use, control, conservation and development. This cannot be achieved without the active participation of all the coriparian states of a river basin.

vi) It should be in the strategy of Bangladesh to explore the role of SAARC in harnessing and utilization of the vast water resources of the Himalyan river systems. Such water diplomacy can work smoothly if political relations among the states concerned are friendly and if a shared desire and strong will to exploit the water resources for shared benefits can draw the capital inputs required. SAARC provides the possibility of a framework for the finding of more meaningful, durable solution to political tensions emanating from historical disputes and their everpresent repurcussions particularly if these are disputes with a regional dimension. SAARC can play a useful role in fostering mutual cooperation in river basin development in the region. The mountain sites of Nepal could generate power to meet the energy need of the South Asian region. The Ganges-Brahmaputra has approximately 10 percent of the world's total hydel power potential. Countrywise estimates show that Bangladesh has a potential of 6,000 MW, India (the Himalayan region) of 25,000 MW, and Nepal of 83,000 MW.[69] Greater availability of energy supplies would enable widespread use of pumping sets and tubewells to exploit ground water and extend irrigation. It would provide a cheaper communication system, thereby lowering production costs and extending markets. It would also encourage the growth of power based and related industries and generate employment opportunities. However, very little of this potential has been harnessed. For optimum exploitation, cooperation is a must and that entails negotiation and consensus. SAARC can play a useful role in it.

69. Nandita Bhatnagar, *op. cit.*, p. 305

vii) Some experts suggest a multilateral arrangement which may function even beyond the SAARC framework. The first step in such cooperative river basin development might be the establishment of Joint Committees of the co-basin states. The Committee would establish institutes or centres where the full range of thchnical specialists appropriate to river basin planning including scientists, engineers, sociologists, legal scholars, economists, hydrologists, etc. would work together on joint programmes of research, training, investigation, monitoring and basin planning. The staff would be drawn from each of the co-basin states.

viii) Paucity of resources is a constraint, not only in national terms but also in regional terms, in the comprehensive development of water resources in the developing world. Bangladesh should make its best efforts to mobilize resources for harnessing and developing the water resources from international sources for the purpose of realizing optimum benefits for the region as well as for herself.

The foregoing bears testimony to the fact that cooperation among the co-riparian states is an imperative. Nevertheless, stupendous spadework at the homefront in Bangladesh is essential for comprehensive water resources development. Afterall it is the home that should be mangaed first. So Bangladesh strategy should be a reasonable blending of the two options stated above.

Domestic Water Resources Development

Water development strategies in the country are constrained by a considerable dependence on India for adequate supply of water in the dry months as we have seen earlier. In connection with India's water diplomacy it has also been argued that India denies water to Bangladesh and at the sametime undertakes and implements projects to utilize water resources. Bangladesh's water diplomacy has so far been charactrised by protests and vocal pleas basically for receiving recognition from India regarding her (former's) water rights over the cross-border rivers. While a vigorous water diplomacy vis-a-vis

India in the line suggested above is always advocated, this however is a necessary but not sufficient condition for development of water resources. It is in this perspective that certain policy options for domestic development of water resources are offered.

The first is flood control. A debate has been going on in the country over the past decades on whether we should and whether it is possible to control flood. Some scholars have advocated for controlled flood instead of flood control. The idea is to contain the damage by flood through training of river channels and adjusting our cropping patterns, habitat and other economic activities to it. In view of the fact that it is not technically and financially possible to control flood effectively and that heavy silting up of the river and channel beds results in increasing damages to life, property and crops, the idea of controlled flood deserves consideration by our planners and engineers.

A second related suggestion is to undertake more and more drainage and irrigation projects. The dilemma of lean season scarcity of water again comes in although because of the deltaic nature of our land, storing water at large scale is not a feasible proposition it still remains to be seen whether such storage of water at local level through excavating and re-excavating ponds, khals and other water bodies and through building appropriate water control structures is feasible.

A third suggestion would be in the field of water management and water conservation. A water development scheme in terms of embankment, or re-excavation of major channels and constructing water control structures may not be sufficient for the eventual optimum utilization of the water. The internal management and distribution of water is a problematic area in Bangladesh for which the installed capacities of the projects cannot be fully utilized. For internal mangement, equitable distribution and efficient use of water, a network of internal channels and irrigation command area should be developed. Seepage and wastage also should be minimised.

Finally, the debate is between the use of surface water and ground water. Perhaps no single option would be appropriate because of varying regional, physiographical, hydrological and geomorphological reasons. What is suggested here is a conjunctive use of ground and surface water. Bangladesh, therefore has to undertake a massive homework to increase its infrastructural facilities and to maximize its water utilization within the country. Thus, to ensure a sound water resources development strategy, a consitent and rational policy both in and outside of the the country has to be pursued by the Government of Bangladesh.

ANNEXURE

Annexure-A

REGIONAL MONTHLY STREAM FLOW AVAILABILITY

1983 Water Use Condition

Available Streamflow[1] (M^3/sec)

Region		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Northwest	a[2].	584	1,340	3,740	7,920	7,920	7,220	3,590	1,390	873	573	450	417
	b.	428	940	2,070	5,450	5,580	5,390	2,320	1,210	725	482	361	426
Northeast	a.	2,000	5,310	13,500	18,700	17,400	12,200	6,280	2,060	756	333	100	307
	b.	733	3,340	11,200	17,800	15,000	10,200	4,400	1,440	580	264	45	114
Southwest[a]	a.	271	513	1,560	4,820	7,650	7,030	3,130	1,260	648	382	267	190
	b.	136	271	1,230	3,330	6,260	5,510	2,320	988	492	245	159	95
South-central[b]	a.	1,920	3,840	8,380	16,500	21,500	18,800	9,600	3,740	2,380	1,450	1,150	1,120
	b.	1,420	2,900	6,830	13,900	18,300	15,830	7,470	3,130	1,830	1,210	903	952
Southeast	a.	558	1,090	3,230	4,870	3,920	2,650	1,640	831	553	523	426	378
	b.	267	382	1,550	2,690	2,570	1,600	836	453	383	325	286	272
Total	a.	5,330	12,100	30,400	52,800	58,400	47,900	24,200	9,280	5,210	3,260	2,390	2,410
	b.	2,980	7,830	22,900	42,200	47,700	38,530	17,300	7,220	4,010	2,530	1,750	1,760

Notes: 1. Available streamflow for a region represents the total outflow from the region.

2. figures in row 'a' designate average streamflow (50% dependable). figures in row 'b' designate five-year, one-month low flow (80% dependable).

3. All values are rounded to three significant digits.

[a]About 45 percent of total area has salinity greater than 2000 micro-mhos during January-April in the region.

[b]Excludes the streamflow in the Tetulia River which contains about 50 to 60 percent of total streamflow of the Southcentral region . About 25 percent of the total area has salinity greater than 2000 micro-mhos during January-April.

Source : Master Plan Organization (MPO)

Annexure-B

MONTHLY STREAM FLOW AVAILABILITY

1983 Water Use Condition (Figues in M^3/sec)

Rivers		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Brahmaputra[1]	a.	7,520	14,700	30,700	46,300	42,700	36,000	22,600	10,300	6,590	4,790	4,130	4,730
	b.	6,500	12,100	25,700	40,400	36,300	30,100	17,800	8,860	5,550	4,230	3,650	4,070
Ganges[2]	a.	1,280	1,590	3,500	20,500	40,800	37,400	15,600	5,060	2,830	1,660	1,370	1,100
	b.	920	1,270	2,730	14,600	34,100	27,800	10,600	3,860	2,370	1,380	1,130	870
Padma[3]	a.	8,950	15,600	29,300	59,000	76,700	68,900	36,500	15,900	9,930	7,260	6,110	6,130
	b.	7,870	13,400	26,600	53,200	67,600	62,800	30,900	14,000	8,970	6,300	5,139	5,620

Notes : Figers in row 'a' designate average stream flow (50% dependable), Figures in row, 'b' designate five year one month low flow (80% dependable). All figures ore rounded to there significant digits.

[1]Based on the streamflow data for the water years 1965-70 & 1972-82 at Bahadurabad.

[2]Based on the streamflow data for the water years 1975-82 at Hardinge bridge (post-Farakka conditions).

[3]Based on the streamflow data for the water years 1975-82 at Baruria (post-Farakka conditions). The figures represent the combined streamflows of the Brahmaputra river at Bahadurabad, the Ganges river at Hardinge bridge and other streamflows from and to the intervening area bounded by Bahadurabad, Hardinge bridge and Baruria.

Annexure-C

REGIONAL SURFACE WATER AVAILABILITY IN FEBRUARY

(1983 Water Use Condition)

Inflow from India to Region	Flow between Regions	Inflow from Brahmaputra-Ganges-Padma Rivers to Region	Streamflow Generated in Region	Outflow from Region	Static[1]/ Water	Instreas[2]/ Storage	Major Sources[3]/ of Streamflow
(m^3/sec).	(m^3/sec)	(m^3sec)	(m^3/sec)	(m^3sec)	(m^3/sec)	(m^3/sec)	(Rivers)
			Northwest Region				
a. 421	0.0	0.0	—5.6	450	21.5	13.2	Teesta (33%), Dudkumar
b. 347	0.0	0.0	—22.8	361			(30%) Dharla (18%).
			Northeast Region				
a. 223	0.0	75	—255	100	48.1	35.4	Kushiyara (75%), Dhaleswari
b. 180	0.0	68	—304	45			(17%), Surma (25%), Old Brahmaputra (17%).
			Southwest Region				
a. 2.4	31	193	67	267	8.0	8.3	Gorai (58%), G.K. Intake
b. 1.7	23	89	57	159			(4%), Mathabhanga (0.7%).
			Southcentral Region				
a. 0.0	126	980	36	1150	1.2	0.5	Bishkhali (41%), Buriswar
b. 0.0	77	804	28	903			(27%) Arial Khan (5%).

Contd.

				Southeast Region				
a.	80	0.0	18.7	—36.7	426	0.0	7.3	Karnafuli (86%), Gumti (3%) Feni (2%), Sangu (2%), Matamuhuri (2%).
b.	62	0.0	18.7	—71.1	286			
					Total			
a.	726	157	1270	—194	2390	78.8	64.7	—
b.	591	100	980	— 313	1750			

[1] Based on depth of 0.5 meters abstraction for Northwest, Northeast, Southwest, Southcentral and 0.0 meters for Southeast region at 24 hours/day continuous for a 90-day period. The figures approximate an average condition for the December-April period.

[2] Based on a depth of one meter abstraction for the rivers having a width less than or equal to 100 meters at 24 hours/day, continuous pumping for a 90-day period. The figures approximate an average condition for the December-April period,

[3] Percentage for major source of streamflow is based on outflow figures (50% dependable) of the catchments containing the major source rivers and of the entire region.

Notes : Figures in row 'a' designate average streamflows (50% dependable). Figures in row 'b' designate five-year, one-month low flow (80%) dependable. Negative figures indicate the 1983 water uses in a region are greater than the streamflow generated in the region.

SOURCE: Master Plan Organisation (MPO)

Annexure—D

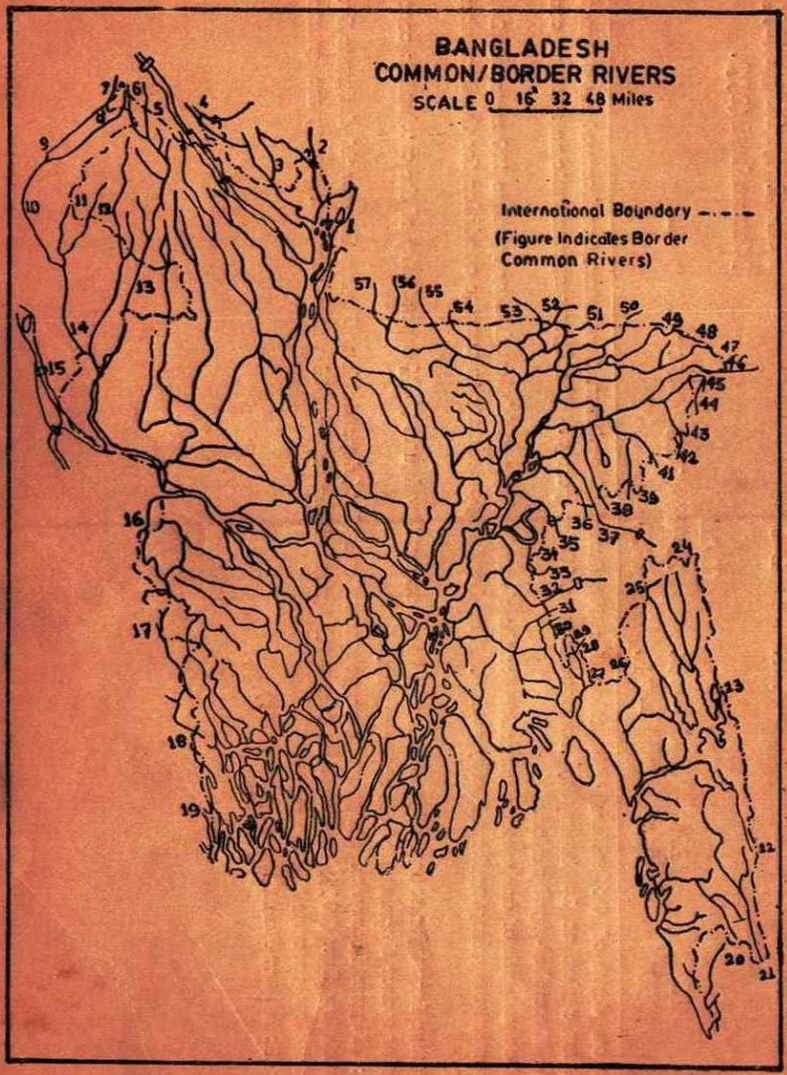

Fig 1 Indo-Bangladesh Common/Border Rivers

Sl. No.	*Name of Rivers*
1.	Brahmaputra
2.	Dudhkumur
3.	Dharla
4.	Teesta
5.	Kharkharia-Jamuneshwari
6.	Talma
7.	Karotoya-Atrai
8.	Dahuk
9.	Mahananda
10.	Nagar
11.	Kulik
12.	Tangon
13.	Punarbhaba
14.	Pagla
15.	Ganges
16.	Mathabhanga
17.	Kobodak
18.	Ichamati-Kalindi
19.	Raimongal
20.	Matamuhuri
21.	Rankhiang Khal
22.	Thega or Kawrpin
23.	Karnafuli
24.	Kasalang
25.	Myani Khal
26.	Halda
27.	Feni
28.	Muhuri
29.	Selonia
30.	Little Feni-Dakatia
31.	Gumti
32.	Salda
44.	Bijni
34.	Howra
35.	Anderson Khal
36.	Sonai
37.	Sutang
38.	Khowai
39.	Karangi
40.	Lungla (Gopia Lungla)
41.	Dhalai
42.	Monu
43.	Juri
44.	Sonai-Bardal
45.	Kushiyara
46.	Surma-Meghna
47.	Sari-Gowain
48.	Piyan
49.	Dhala (Dhalai Gong)
50.	Umium (Bogra)
51.	Nowagang
52.	Dhamalia
53.	Jodukata
54.	Someshwari
55.	Nitai
56.	Bhogai-Kangsha
57.	Chilla Khali

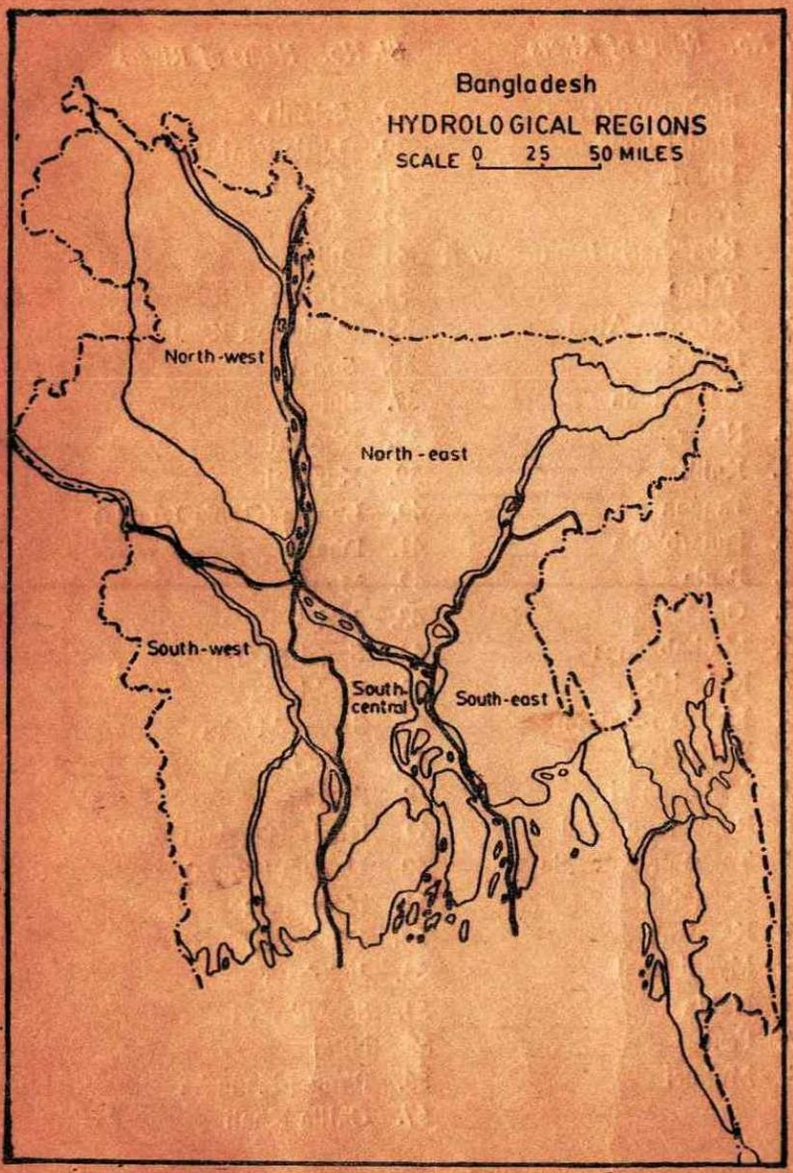

Fig 2 Hydrological Regions of Bangladesh
Source : Master Plan Organization (MPO)

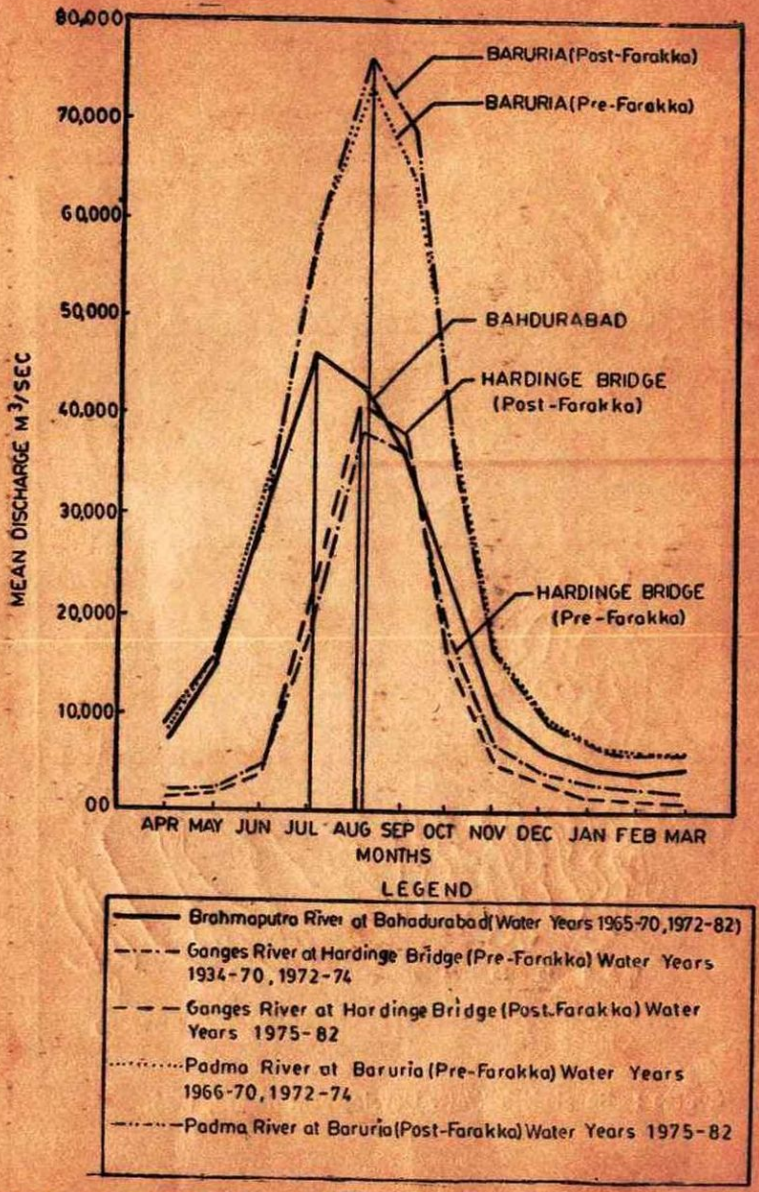

Fig 3 Mean Monthly Discharge Hydrograph for the Ganges, the Brahmaputra and the Padma River

Source: Master Plan Organization (MPO), 1985

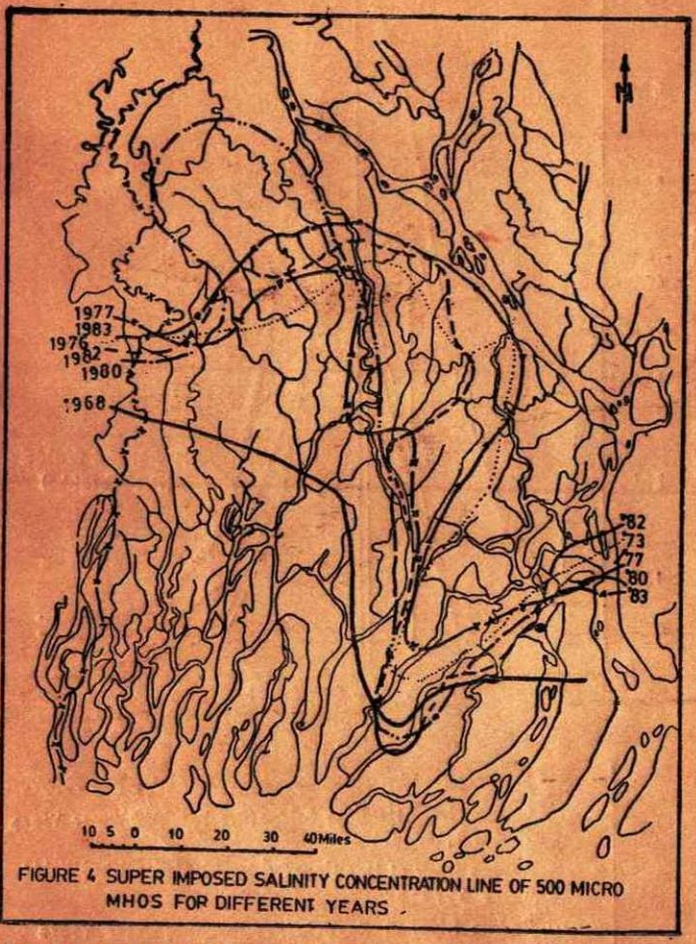

FIGURE 4 SUPER IMPOSED SALINITY CONCENTRATION LINE OF 500 MICRO MHOS FOR DIFFERENT YEARS .

Source : Bangladesh Water Development Board, 1986.

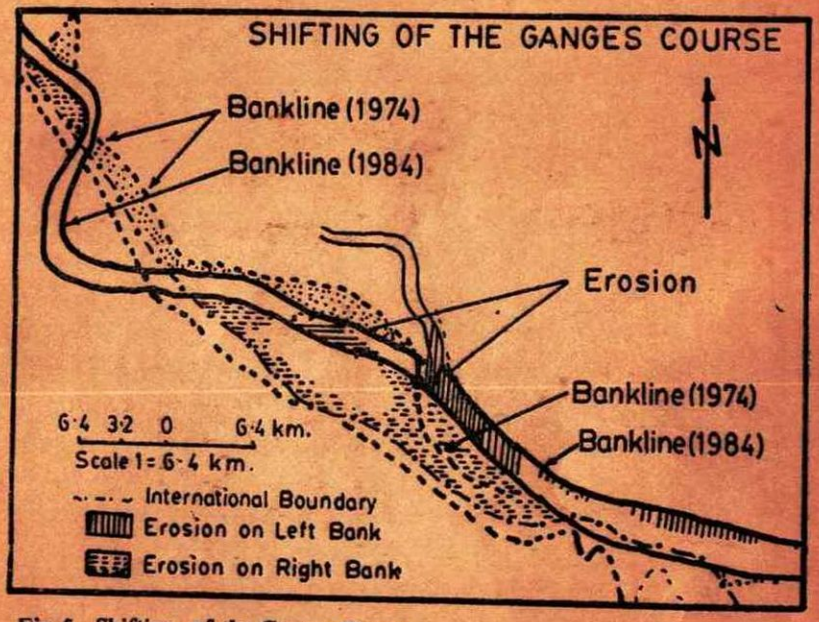

Fig 5 Shifting of the Ganges Course

Soure: *The Bangladesh Times*, 30 December 1985