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DEVELOPMENT OF WATER RESOURCES IN BANGLADESH

Introduction

Water is an obvious outcome of hydrological function involving both land and sea as well as the atmosphere. As a renewable resource, water is the most essential of all the resources in the earth for the existence of life. In the present paper attention will be confined to the development of that sector of hydrosphere which is connected to the land part. This involves consideration of running water (rivers and channels) precipitation (rain, snow, hail, fog etc.) and ground water. The development of water resource is related to the availability of water in the light of foreseeable demand for agriculture, industry, domestic use of water, navigation, hydroelectricity, recreation, drainage, population control, flood control, soil conservation and population growth.

The main problem with development of water resources originates from the fact that the precipitation is not uniformly distributed over the surface of the earth both spatially and temporally. Though net-work of river system to some extent minimise the crisis but still it is found insufficient particularly in the lean period. On the other hand, ground water is not available every

where though there is a constant interchange between surface and ground water.

As the gap between population growth and production of food has been ever widening, the primary concern of water development is to ensure the distribution of water for irrigation uniformly so that sufficient food grain can be produced through double or multiple cropping system.

After agriculture, industry is the major consumer of water particularly in the developed countries. In generating hydroelectric power water is used but not consumed. So, there is no competition in using water by hydro power generating plant and other sectors. Another important use of water is for domestic purposes. A current estimate shows that 75 percent of the urban and only 43 percent of the rural population have access to clean water in the developing countries.[1] Though the availability of water is the precondition for its use and development, the extent of development and management depends much on the economic condition and technological strength of the country.

It is a relevant resume on Bangladesh economy that the country is poor in terms of both technology and resource base. Though water is an important natural resource, an apparent paradox is that there is plenty of water that the country receives and yet operationally there is tremendous shortage.

1. Asit K. Biswas, "Some Major Issues in River Basin Management for Developing Countries" Paper Presented at the National Symposium on *River Basin Development*, Dacca, December 4-10, 1981.

The main objective of the paper is to evaluate and point out the issues related to the above paradox. The first part of the paper focuses on the water resource base and its availability within the country, while the second part assesses the sector-wise needs for various economic activities. In section three, the paper reviews the existing programmes and policies of water development in Bngladesh. Finally the paper makes some remarks and conclusion on the existing situation.

Water Regime in Bangladesh

Bangladesh is not a large country in area but large in size accomodating about 90 million people within a little space of 55,600 sq. miles. The country is a part of one of the largest delta of the world consisting mainly of alluvium deposited by the mighty Ganges, Brahmaputra and the Meghna situated on the foothill of the Great Himalayas. Due to the existence of the Himalayan Ranges in the north and a bay on the south, the country is characterized by affective monsoon wind which causes heavy rains in the wet season and little rains in the dry. Not only that, the whole baisn area slopes down towards the south, as a result a number of river system has evolved all over the area which fall into the Bay of Bengal.

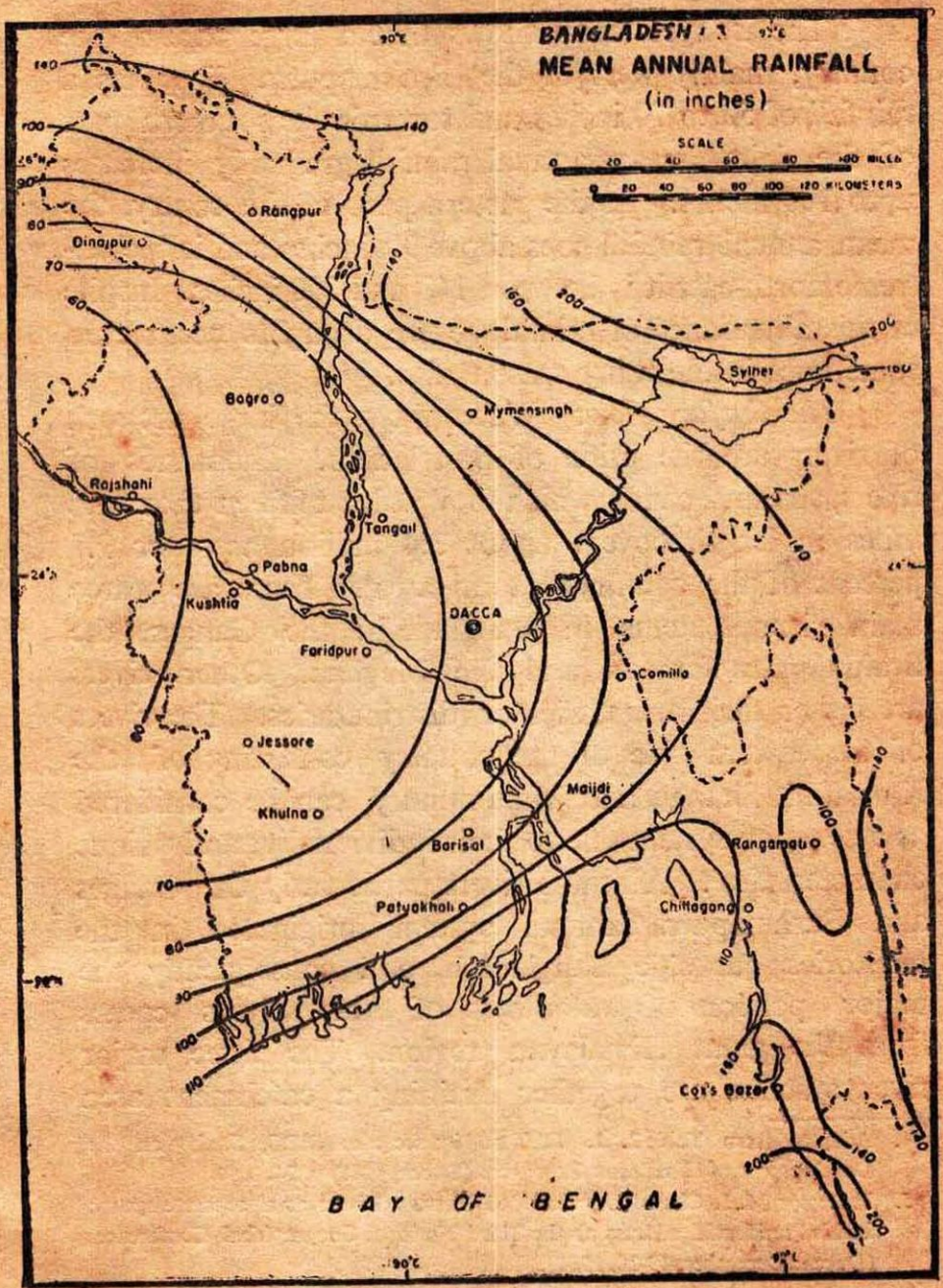
Bangladesh experiences more or less a tropical climate characterized by high temperature, excessive humidity and heavy rainfall with a substantial seasonal variations. Her fertile alluvial soil and climate clothe most of the land in an evergreen mantle, though the

country suffers from lack of natural forest with less than 10 percent of the total area[2].

The regime of water in Bangladesh comprises of a vast amount of surface flow, rain water and the ground water. Innumerable rivers, canals, beels, haors and ponds are the containers of this water except those that flows to the Bay and others remain under ground. Though Bangladesh receives a large amount of water, the annual picture conceals important fluctuations in the flow during the whole year. Most of the water comes during the Monsoon period in terms of both runoff and rain.

The rain water: Three principal sources of rainfall in Bangladesh are (a) rains due to western depression of winter (b) early summer thunderstorms or Nor' Wester rain and (c) the summer rains from S.W. Trades known as the monsoon. The mean annual rainfall in Bangladesh varies from 50 inches in the western part of the country to about 200 inches in the north east, while the average annual rainfall is 90 inches[3]. The isohyets shows the spatial pattern of rainfall throughout the country (Map). There is also a wide seasonal variation with almost 90% of the rainfall occuringni the 6 months period of monsoon starting from May and ending in October. But generally there is no significent or very irregular rain from November through March in most years. This is the dry season in Bangladesh with tremendous shortages of water.

2. Haroun Er Rashid *Geography of Bangladesh* (Dacca : University Press Limited, 1977, p. 132.
3. Bangladesh Bureau of Statistics, *Statistical Year Book of Bangladesh* 1980 p. 1.



Source : Harun-er-Rashid, *Geography of Bangladesh*, (Dacca University Press Ltd. 1977) p. 100.

The isohyets map shows that a large part of the country, mainly west of the Brahmaputra line, has a rainfall of 50 to 70 inches and towards the southern part of the delta, mean annual rainfall gradually increases upto 100 inches. In the eastern part of the coutry, the mean annual rainfall goes above 90 inches and in the extreme north-east it is between 140 and 200 inches. Inspite of this abundance of rainfall severe droughts occur even sometimes in the rainy season also.

The Surface flow: Water ways, the large network of rivers are the pride of Bangladesh. Thousands of rivers, streams, canals which total at least fifteen thousand miles in length covers about 3.4 million acers or 9.7 percent of the country's total area[4]. There are three main river systems in Bangladesh; the Ganges, the Brahmaputra/Jamuna and the Meghna. Other rivers are either their tributaries or distributaries. The rivers of the eastern side of the country consisting of the Karnafuli, Shangu and Matamuhury can be considered as a seperate system due to their individuality and unique characteristics[5]. All these rivers particularly the Ganges and Barhmaputra/Jamuna system originated in the territories out side Bangladesh and consequently the major portion of waterflows of these rivers comes from the great Himalayan region. The three major river systems are together draining a catchment area

4. Adapted from Table 2. 1. *Ibid*, p. 46 ; see also BIDS, Study on the Development of Himalayan Resources (Dacca, 1981) p. 24.
5. Professor M. I. Chowdhury identified Eastern Rivers as a separate system in his Presidential address at the Third National Geographical Conference, (Dacca: December, 19-20. 1981).

of over 600,000 sq. miles of which about only 7.5% lies in Bangladesh [6].

On the average around 930 million acre feet (maf.) of water is normally available through the river systems annually in Bangladesh including about 870 maf. from outside the country. On the other hand, additional 203 maf. of water comes from rain whithin Bangladesh territory which means the country receives about 30 feet (vertically) of water per acre per year [7]. The table also shows the average, maximum and 75% availability of waterflow in the major rivers of Bangladesh.

The river Brahmaputra is one of the largest rivers of the world with a length of about 1800 miles. It rises from the Kailash of the Himalayas in South West Tibet at an altitude of 17,000 ft. and drains an area of about 234,000 sq. miles, through China (Tibet), Bhutan, India and Bangladesh [8]. The minimum flow of Brahmaputra Jamuna at Bahadurabadghat is about 1,10,000 cusecs and average dry season discharge at the same station is 1,84,000 cusecs. The average annual discharge is about 507 maf, while the dry season amounts (Nov-May) to 112.5 maf. [9]

6. M. Shahjahan, "The Utilization of Water Resources of Himalayan Rivers" Paper presented at the National Symposium on *River Basin Development* (Dacca: Dec. 4-10), 1981.
7. Haroun Er Rashid, *op. cit.*; p. 25.
8. Amjad Hossain Khan and Shahidullah Miah, "Brahmaputra River Basin Development" paper presented at the National Symposium on *River Basin Development* (Dacca: Dec. 4-10), 1981.
9. Bangladcsh Institute of Development Studies (BIDS) "Study on the Development of Himalayan Resources; *Bangladesh Country Report* Theme X. (Dacca: BIDS) July, 1981, p. 110.

The Ganges has a length of 1570 miles upto the mouth of Meghna and drains an area of about 4,31,000 sq. miles of India, Nepal and Bangladehsh[10]. The water resource of the basin has been estimated roughly at 446 maf.[11] If the existing irrigation uses in the upstream in India are excluded the river provides an average discharge of 317 maf. a year at Farakka. The dry season flow (Nov-May) totals only 40 maf. The lowest flow at Hardinge Bridge in Bangladesh was 23200 cusecs in 1976 when India unilaterally diverted the flows of the Ganges at Farakka in her territory. In terms of water contribution to the Ganges, three Trans Himalayan tributaries (out of nine in the whole basin), the Karnali, the Sapt Gangdaki and Sapt Kosi from Nepal contribute about 71 percent of the natural and historic dry season flows and 41 percent of the total annual flows of the Ganges [12].

The river Meghna is the smallest of the three great rivers, drains the north eastern part of the country. It collects water from numerous tributaries flowing from the hills of Assam and Tripura to the north, east and south. The average annual discharges of the Meghna at Bhairab Bazar is 116 maf. per year while dry season flow is only 15.3 maf. The maximum flow in the Meghna is about 145 maf. annually (Table I).

10. G. R. Choudhury and Tauhidul Anwar Khan "Developing the Ganges Basin" paper presented at the National Synposium on *Rivew Basin Development* (Dacca: Dec. 4-10), 1981.
11. *Ibid.*
12. M. Manir-Uz-Zaman, "Ganges Basin Development: A Long Term Problem and Some Short Term Options" *Ibid.*

Table 1. Annual Water Flow in the Major Rivers of Bangladesh

(Fig. in maf.)

Name of rivers with stations	Mean flow	Maximum flow	75% availability
Brahmaputra/Jamuna (Bahadurabad)	507.40	599.40	451.60
Ganges/Padma (Hardinge -Bridge)	275.70	358.56	204.46
Meghna (Bhairab Bazar)	116.20	154.30	94.69
Mahananda (Godagari)	21.18	25.30	14.33
Muhuri (Pasuram)	0.64	1.12	0.45
Sanger (Bandarban)	2.29	3.66	1.23
Bogkhali (Ramu)	0.86	1.14	0.69
Matamuhuri (Lama)	1.90	2.59	1.44
Gumoti (Comilla)	1.84	2.77	1.33
Halda (Panchapukur)	0.94	1.26	0.77
Ichamati (Thandachari)	0.19	0.25	0.16
Little Feni/Dakatia (Gunabati R/Y Bridge)	0.83	—	—

Source : Bangladesh Institute of Development Studies (BIDS), Study on the Development of Himalayan Resources : Bangladesh Country Report" July 1981, P. 110

The rivers act as a carrier of silt. Of all the rivers in Bangladesh the Ganges carries more silt (1.6 billion tons) than the Brahmaputra (0.8 billion tons) and others. These rivers are amongst the heaviest silt carriers in the World.

Table 2. Average Monthly Surface Inflow from India and Major Rivers of Bangladesh (in maf.)

Month	Av. inflow from India	The Ganges at H. Bridge	The Brahma-putra at Ba-hadurabad	The Meghnaat Bhairab Bazar
January	18.7	6.76	11.28	1.29
February	14.7	5.32	8.45	0.97
March	16.7	5.02	10.23	1.38
April	19.7	4.32	14.34	1.97
May	42.3	4.28	34.41	4.20
June	88.9	9.06	68.28	8.03
July	152.5	38.81	95.73	16.97
August	195.5	81.54	97.96	17.98
September	165.6	77.70	76.28	17.28
October	91.8	37.45	47.68	13.55
November	38.6	14.94	22.02	6.47
December	24.7	9.11	14.63	2.15
Annual	869.9	284.31	501.27	92.24

Source : International Bank for Reconstruction and Development (IBRD) "Water Resources Sector Study Bangladesh" Vol. 9, p.

The other important rivers are Tista, Karatoa, Atrai, Bangali, Old Brahmaputra, Dholeshwari, Gumati, Gorai in the northern, western and southern delta and Sangu Matamuhari in the eastern region. Most of these rivers are connected to the main three: the Ganges, Brahmaputra and Meghna by themselves or by numerous channels. There are very few lakes in Bangladesh, namely the Rinkhyongkine and Bogaline in

the north eastern hill and Ashula Bil at the northern end of the eastern Barind. They are actually the natural reservoir of water in the country. The Bills are mostly the legacy of the changed river systems. They are full of water in the rainy season and cultivated when dried up in the winter.

Ground Water: There is a ground water aquifer all over Bangladesh which is suitable for pumping except the areas south of Jessore-Comilla line, where the ground water is saline and the eastern and northern hill areas together with areas closely adjacent to piedmont and flood plain land where water is available but its distribution is more erratic[13]. It is evident from the ground water survey by BWBD that most of the areas of Bangladesh has ground water with water table depth ranging from zero to 30 feet depending on location and season[14].

The total ground water potentiality in Bangladesh has been estimated to be 13.8 maf. on the whole year round and 9.8 maf. for the period of November to April[15]. The average lowering of this water table is approximately 20 feet from the surface in the dry season. On an annual basis the ground water level is in dynamic equilibrium. It reaches almost the surface at the end of monsoon and declines on the average by 12 feet to be recharge again during the subsequent monsoon.

13. International Bank for Reconstruction and Development (IBRD), "Land and Water Resources Sector Study' *Water Resources* Vol. 9, 1972. p.
14. Bangladesh water Development Board, BWDB Water Supply Paper No. 403 (Dacca: May, 1978).
15. Bangladesh Bureau of Statistics, *op. cit.*, 1979. p.

Water Requirements in Bangladesh

From the above discussion it is revealed that on an annual basis, sufficient amounts of water enters Bangladesh but annual picture conceals important fluctuations in the course of whole year. The aggregate demands for the various purposes must be met over time and space from rainfall, surface water and ground water. But temporally and also spatially the distribution of rainfall and surface water poses problems as excessive water during monsoon and lack of water in the lean period. As a result almost in every year the country faces either a severe problem of flood during the rainy season and that of droughts in the winter which caused crop damage of millions of acres. Moreover, demand of water during the last two decades has increased substantially as the population of the country has unbelievably increased. The requirment of water resource for various uses in the country is not yet fully assesed. But it is also true that a large volume of water is required for the irrigation of crops, control of salt water intrusion from the Bay of Bengal, navigation, fisheris, industrial, domestic and urban or municipal uses in the dry season as supply of water in this period is not sufficient.

Irrigation: Irrigation for agricultural development in Bangladesh was mainly done by indigenous methods with surface water until 1950 when mechanized system of irrigation was introduced through the use of underground water and gravity irrigation. The Ganges-Kobodakh project of gravity irrigation commissined in 1955 was the first planned irrigation in Bangladesh.

Since then, the system developed over time, though it is involved in multidimesional problems. Both, resource and technology do not permit to bring the whole cultivable land under irrigation. On the other hand, deficit in the food production is increasing with the population. As physical extension of the land is not possible, intensive cultivation of existing available land through proper irrigation system is a must to increase food production. It can be mentioned here that out of 20.5 million acres of net cropped area only 7.1 and 1.5 million acres are double and multiple cropped respectively.[16]. Roughly 3 million acres of gross area are irrigated (1976-77) of which 1.6 million acres are irrigated with surface water[17].

A considerable regional variation has been found in the use of irrigated water with maximum areas in Dacca and Chittagong division which comprise the eastern half of the country. District wise, Kishorganj, ranks the top position followed by Comilla and Sylhet respectively, while Chittagong Hill Tracts and Faridpur districts irrigate the least amount of land[18].

Crop wise distribution of irrigated land (1976-77) reveals that, rice is the main consumer of water, amounting 2.4 million acres land under its cultivation, of which 2 million acres were under Boro rice during winter. Aus variety used the least amount followed by Amon.

16. BIDS, *op. cit.* ; p. 73.
17. *Ibid.*, p. 73.
18. Hamidur Rahaman Khan, "Water Resources of Bangladesh : Its International Perspectives" seminar Paper presented at the Bangladesh Institute of International and Strategic Studies, June, 1980.

Other than rice; wheat, potato, vegetables, sugarcane and pulses are major consumer of water. It is clear from the above discussion that most of the water for irrigation is required during the dry season. Only to irrigates the winter crops, including Boro and to cultivate aus land roughly 54 million acre feet of water are required but available water during this period is much less than the requirements.[19] The Table 3 shows that in February and March about 30% cultivable area is not possible to irrigate.

Table 3: Available Water and Irrigation Requirement During the Dry Season in Bangladesh

	Irrigation requirement in maf.	Available water in maf.	Percent of total area for which irrigation possible
January	14.30	11.10	77
February	14.80	9.20	62
March	15.60	10.15	69
April	9.24	12.69	100

Source : H. Rahman, "Water Resources of Bangladesh : Its International Perspectives" fn. 18.

It is evident from the Table 3 that the available water during the critical 4 months of dry season (Jan-April) is not enough to irrigate the cultivabable area

19. *Ibid.*

except in April. The available water shown in the same table includes 50% of discharges of the Ganges, Brahmaputra and Meghna and 60% of other minor rivers and all extractable ground water. Such reduction of water from the surface flow may be pumped for irrigation without adverse effects on navigation and other rural use[20]. The net withdrawal will actually be less as a certain amount of water will inevitably return to the river as surface runoff and through ground water generation. But more than 60% reduction of water from the rivers will affect adversly not only on navigation and fisheries but also on the natural environment.

Navigation: With the rapid development of road transport, importance of waterways have been distorted to some extent. Another important cause, for which water transport has been handicapped is siltation in the river beds. Most of the rivers of the western part of the country are silted up and many of them dry up during the lean season which resultant a great fluctuation in the total route lengths between dry and wet season. According to the Inland Water Transport Authority, wet season route lenght is about 5240 miles, but it shrinks to 3250 miles in the dry season[21]. Though 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 months converted the water transport into a restricted and seasonal one. Particularly, some section of water ways

20. BIDS, *op. cit.*; p. 50.
21. BIDS, *Ibid.*; p. 145.

are most seriously affected by the upstream diversion of water from the confluence of the Ganges with the Brahmaputra river at different points. The ferry tarminals at different busy road transections have to move during the low flow due to upstream diversion of water. Shifting of these tarminals costs millions of taka and an unnecessary suffering of the traveller.

Fisheris: Fisheris hold a unique position in the economy of Bangladesh ranking second to agriculture as an economic activity. About 15 million people directly and indirectly depend on fishing for livelihood and fish forms the second staple diet for about 80% of the country's people. The crucial role of fisheries in terms of employment, nutrition and income distribution needs special attention for the betterment of economy. But the natural movement of fish is handicapped by water control measures. The effects of low lift pumping on river water levels and flows occure mainly on small perennial rivers. Migratory movements of fish between spawning grounds and the major river and the environment in which the fish spawn, are adversely affected by major water schemes.

Salinity Control: With advent of monsoon the flows in the rivers increases and salinity front starts receeding to the Bay. But it comes back to the land when river flows go down. The intrusion of saline water, thus, depends completely on the supply of fresh water from the major rivers. The advent of saline water not only affects agriculture but also threatens the mangrove forests of the Sunderbans. The forest is threatened

with the loss of its potential of producing 353 million cubic feet of commercial timber annually if fresh water flows continue to be decreased[22].

In this circumstances upstream diverson of water by India has made the situation more acute which has no easy solution for Bangladesh to solve under the present technological condition of the country. Besides the agricultural and other uses, large volumes of water are required in the non monsoon period for control of salt-water intrusion, maintaining minimum water depths and widths of the streams and pesiculture.

Impact of Surplus and Shortage of water

The major two natural calamities—flood and drought which devastate the crops almost every year has created continuous deficit in the food production thereby forcing the country to be dependent on the agricultural largesse from other countries. As India progressivly increases the use of upstream water, it severely affects not only the agricultural Production, navigation and fisharies but also the underground water table, aforestation and other aspects of the natural environment.

Floods occure in Bangladesh mainly due to run off from monsoon rains combined with snowmelt from the Himalayan Ranges. The rivers of Bangladesh can not contain this large volume of water as their gradient and carrying capacity of load is very low. River beds have been rising up in every year due to siltation which allows more areas under flood damage every year. A

22. BIDS, *Ibid*, ; p. 119.

recent study shows that on the average (1954-1978) 37.5 percent of the total area of the country are vulnerable to flood[23]. Drought is also a similar problem, as the cultivators have to depend fully on the mercy of the monsoon for rain. Shortage in the supply of water affects in agriculture, natural vegetation, navigation, fisheries and other rural urban, and domestic and industrial use in various ways. One of the most important of them is the saltwater intrusion which have long been recognized as a handicap in the development of agriculture and forestry in the southern region. The Bay of Bengal is the source of saline water in the coastal region. The heavy pressure of surface flow in the rainy season prevents the saline water from intruding the inland but relatively small fresh water discharge can not prevent them in the dry season. Not only that, the upstream diversion of water is lowering the water level in the downstreams with a corresponding lowering of the ground water and consequently, some area irrigated from ground water are presently facing difficulties due to inadequate supply of fresh water. Hundreds of shallow tubewells cannot lift water in the dry season due to fall of the watertable. As a result 10 million acres of agricultural land located south of the Ganges gradually lossing their productivity.

National Policy for Water Development

No significant efforts have been made for water resource development until 1964, when a Master Plan

23. BIDS, *Ibid.* ; p. 119.

was prepared. The prime objective of this plan was flood control. The plan undertook a massive scheme of empoldering through 50 major projects to provide flood protection and drainge facilities to about 12 million acres and irrigation facilities to about 8 million acres of land by the year 1985 [24]. The weakness of the 1962 Master Plan is that it overlooked the importance of ground water.

Another important step was taken by International Bank for Reconstruction and Development (IBRD) to study Land and Water Resources Sector Study in Bangladesh in 1972. The objectives of such study was to asses the agricultural development potential of the country and to devise a viable agricultural development strategy. The IBRD report provides the factual basis for a programme of water control, identified the actual water needs and supply and how irrigation requirement can be met by major regions.

There are a number of agencies and organizations for development of water resources in Bangladesh of which Bangladesh Water Development Board (BWDB) and Bangladesh Agricultural Development Corporation (BADC) are important. BWDB are responsible for providing surface water irrigation drainage, flood control, erosion control, town protection and river training throughout the country. On the other hand, BADC concentrates on irrigation through low lift pumps (LLP) utilizing surface water, Deep Tube Wells (DTW) and Shallow Tube Wells (STW) using ground water.

24. BIDS, *Ibid.*; p. 124

The main objective of water resource development is the optimum use of available water resources in order to achieve self sufficiency in the food production and improvement of general economic condition of the country. To increase the present food production from 13 million tons to 20 million tons, the Second Five Year Plan (SFYP) envisaged a radical change in the agricultural system through irrigation facilities and control of surface water. Water development policy of the government also includes control of saline water, proper utilization of underground water, provision of timely irrigation facilities, canal digging, empoldering and erosion control[25]. To reduce pressure from cash resources, it was also aimed at that, irrigation system would be accelerated through spontaneous participation of the mass people. The target of SFYP is to be undertaken 72 lakh acres of land by the end of the period (1980-85) from the present 29 lakh acres[26]. Since there is no new land to be brought under cultivation the productivity of the present available land must be increase. Water plays a fundamental role in achieving this short term goal.

25. Planning Commission of Bangladesh, *The Second Five Year Plan, 1980-85* (Dacca : 1980), p. xii 79.
26. *Ibid.* ; p, 80

Table 4 : Irrigation and Flood Control Programme During SFYP.

(Figures are in lakh acres)

Agency/ Programme	Achievement as of June 1978	Expected achievement as of June 1980	SFYP target	Cumulative figures
a. BWDB				
Flood protection	45.10	47.82	15.00	62.82
Irrigation (canals)	1.60	2.40	7.60	10.00
b. BADC				
Irrigation by various types of tube wells	17.49	22.55	35.10	47.65
Private irrigation by indigenous methods	9.66	11.68	2.67	14.35
Total	28.75	36.63	35.37	72.00

Source : Planning Commission, Government of People's Republic of Bangladesh *The Second Five Year Plan* 1980-85. Dacca: 1980, p. XII-80

Long term strategy for water resource development in Bangladesh is still a conceptual affaire. The SFYP notes that ultimate solution of water resources development problem lies mainly on long term basin-wise development of surface and ground water but this is much more complicated than any other individual project[27]. There is no sufficient basin-wise data on

27. Ibid, p. 81.

which a long term project can be based. Therefore, preference has been given on investigation, surveys and studies, so that a balanced and reasonable programme for long term development of water resources can be made during the present and subsequent plans.

In the implementation of water development projects a large amount of capital expenditure and a long periods of time were involved. It was observed that sufficient funding were never available which resultant a substantial lingering in the implementation process. On the other hand massive flood control scheme has been proved to be in effective as it adversely affected on the natural environment within a short period of time. Decreasing of land fertility and reduction in the river depths through sedimentation are mainly due to poldering and embankment. As a result rivers usually change their courses due to disturbance on their normal flows which allows more areas under severe damage either through erosion or flooding. But in the dry season when surface flows are reduced substantially due to upstream use of water, most of the irrigation projects in the down stream become inactive. In this circumstance, the government emphasised on medium and small projects highlighting the utilization of ground water through tubewell and surface water through low lift pumps. These projects are labour intensive and low capital cost per acre. This change in approach has been further threatened by lower supply in dry months.

Conclusion

Bangladesh is a small country with innumerable problems. The economy of the country is an agrarian with a poor resource base, and the system of agriculture is still traditional. Modernization of the economy has not yet been possible since the country has been suffering from poverty. Inspite of all kinds of limitations, it is hoped that self sufficiency in the food production through development of agriculture would be a break through in the poverty circle. But the present system of agriculture is characterized by low productivity and low cropping intensity because most of the agricultural land are single cropped and the crops are seriously handicapped by natural hazards. As water is a unique input to the agricultural sector, its management and development is most essential for agricultural development. But the nation has failed to properly control the water resources sector for the betterment of people.

On an annual basis Bangladesh receives a large volume of water but its distribution is not uniform over time and space as there is excessive water during the monsoon period and tremendons shortage of water during the dry season. Most of the water development projects (particularly the irrigation projects) does not function as control over the surface water in the part of Bangladesh is little. Development and use of ground water depends much on the supply of surface water. The unilateral withdrawal of water from various rivers in the upstream during the last two decades has seriously affected the appropriate water development in Bangladesh. To make

optimum use of water resources individual water projects by an individual country should be stopped and basin wise regional development approach for water resource planning should be initiated.

Use, management and conservation of water resources of rivers are easier when it is a national basin within one's territory. But when it is multinational basin its development and management is rather complicated. The success of any project for an international basin development is largely dependent on the political atmosphere of the respective country.