BRAHMAPUTRA-GANGA LINK FOR THE DEVELOPEMTNT OF EAST AND NORTH EAST INDIA

BY

PROF. S.K. MAZUMDER, GENERAL MANAGER
I.C.T. PVT. LTD. NEW DELHI
(Former AICTE Emeritus Professor at Delhi College of Engineering and Dean, Faculty of Technology, Delhi University)

ABSTRACT

In spite of having abundant water resources (31.3% of the country's total water resources) and hydro-power potential (41.6% of India's total hydro-power potential), Brahmaputra and Barak basins in north-east region is not developing. Percentage utilization of water resources and hydro-power potential are respectively 1.8% and 2.35% only. This is mainly due to the extremely poor investment in the region compared to the huge investments made for the development in other regions of the country. Earlier, Captain Dastur and Dr. K.L. Rao proposed link canal systems for transfer of water resources from the flood prone Brahmaputra and other basins in the north to the drought prone areas in South and West. These plans were, however, rejected by the National Water Development Agency (NWDA), set up by the Government of India in 1986, as they were found to be unsound, technically not feasible and economically not viable. NWDA, an apex body of Ministry of Water Resources, however, recommended interlinking of Indian rivers under two broad heads, namely, Himalayan and peninsular components. Brahmaputra-Ganga link, a proposal under the Himalayan Component is given the topmost priority by NWDA. The scheme envisages interlinking Manas, Sankosh, Tista, Ganga and Bhagirathi-Hoogly river systems through construction of reservoirs, barrage and canals and improving the waterway of the rivers. The scheme, approved by NWDA after thorough investigations, will be extremely useful for the development of irrigation and hydro-power, partial relief of flood hazards and improvement in the navigational facilities connecting Allahabad with Kolkata (National Waterway No. 1) and Dibrugarh with Kolkata via Farakka feeder canal (National Waterway No. 2).. There is shortage of water at Ganga upstream of Farakka barrage during lean period, especially after the Indo-Bangladesh friendship treaty under which 50% of available flow reaching Farakka (after meeting the requirements of northern riparian states) has to be passed to Bangladesh. Transfer of surplus Brahmaputra water to Ganga upstream of Farakka barrage under the proposed scheme of Brahmaputra-Ganga link will ensure that the feeder canal runs with its design discharge of 335 cumec during lean period so that a minimum navigable depth of 2 m is available, the sediments deposited near Kolkata port area can be flushed out and the salinity of Hoogly river water used for drinking can be controlled.

INTRODUCTION

History shows that the economic prosperity of a country is closely linked with the development of its water resources. In the year 1951, India had a population of 300 million. Today we have more than 1000 million people which is going to increase to 1500 million in 2025 and by 2050 it is expected to stabilize at 1850 million- the largest population in the world. With the rising population and growing expectation for a better standard of life, demand for food, fibre, power and transport is going to increase manifold. For example, our food requirement will increase from 250 MT in 2001 to 375 MT in 2025 and 460 MT in

2050. (Iyer, 1989). Similarly, the power requirement (Srivastava, 2000) will increase from 5,69,650 MU in 2001 to 10,58,440 MU in 2011, corresponding figures for peak power demand being 97,757 MW and 1,76,647 MW respectively. The only way we can meet the challenges is through harnessing the water resources of the country. It is established that assured irrigation supply increases productivity of land besides the fact that a farmer can raise two or three crops in a year, which is not feasible in rainfed agriculture. It is known that hydro-power is a renewable and pollution free energy. For healthy power supply system, at least 40% of the load should be shared by hydro-power for peaking purpose. Out of a total Hydro-power potential of 84,000 MW (Mohile, 2000) in the country, Brahmaputra basin alone has 35000 MW i.e. 41.6% of the country's total hydro-potential. Table-1 shows the Hydel potential assessed for the major river systems in India as well as the development of hydro-power up to year 1999. Brahmapautra has the lowest utilization i.e. 2.35% only up to year 1999. Although Brahmaputra and Barak basin (up to Bangladesh) has 585.6 km^3 of water resources out of an estimated all India potential of 1869.3 km^3 i.e. 31.3% (IWRS-2002), utilizable surface and ground water resources in Brahmaputra and Barak Basins are found to be only 24 km^3 and 29.7 km^3 respectively. This is due to the fact that most of the area in the Brahmaputra and Barak basins are hilly with steep terrain resulting in less agricultural lands. Because of its low geographical area (6% of the country), its hilly terrain with forests and low population density, per capita availability of water in this region is the highest in the country as shown in Table-2 (Goel, 99). Fig. 1 shows the availability of water at the proposed Jogipopa barrage site from where it

Table 1: STATUS OF DEVELOPMENT OF HYDRO-POWER IN MAJOR INDIAN RIVER BASINS

S.No.	Name of Basin	Potential assessed at 60% load factor in MW	Total of percentage of potential developed or underdevelopment as on 1.10.99
1.	Indus	19,988	21.36%
2.	Ganga	10,715	27.98%
3.	Central Indian Rivers	2,740	23.15%
4.	West Flowing Rivers	6,149	68.33%
5.	East Flowing Rivers	9,532	45.77%
6.	Brahmaputra	34,920	2.35%
	Total	84,044	22.38% (All India average)

Table-2: PER CAPITA AVAILABILITY OF WATER IN DIFFERENT BASINS OF INDIA

Item	Names of Basins				
	Indus	Ganga	Brahmaputra	Barak	All India
Water Resources potential (km^3)	73.3	525.0	537.2	48.4	1869.3
Utilisable surface water (km^3)	46.0	250.0	24.0	-	6903
Ground water potential (km^3)	25.5	171.7	27.9	1.8	452.2
Per capita annual availability of water (m^3)	1757	1473	18417	7646	2214
Annual availability of water per hectare of cultivable area (m^3)	7600	8727	44232	43447	9353

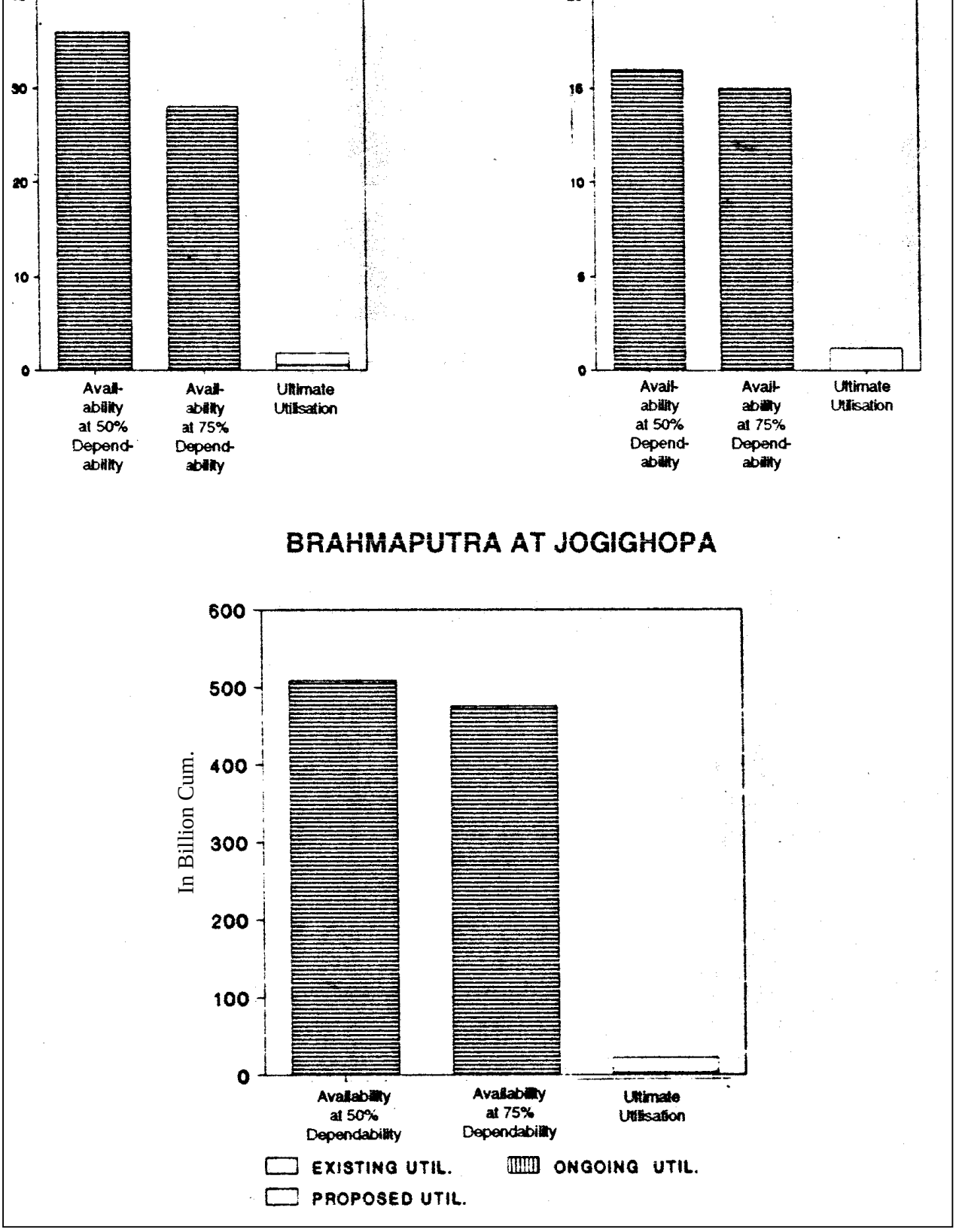

Fig. 1 – Annual Water balance

was earlier proposed to construct a barrage and link canal to divert flow from Brahmaputra to Ganga basin (IWRS- 96). The latest plan to connect Brahmaputra basin with Ganga is by interlinking rivers Manas, Sankosh, Tista and Ganga as shown in Fig. 2. Since the ultimate utilizable water for irrigation purpose is extremely low, it is apparent that a substantial amount of water can be diverted from Brahmaputra basin to Ganga basin through link canals depending on the requirement of Ganga basin and the financial capacity of the beneficiary states /Central Government to invest in the construction of the reservoirs, barrages, canal system, cross-drainage structures, land acquisition etc. Unlike the Ganga-Kaveri link canal which was found to be technically not feasible and economically not viable, Brahmaputra-Ganga link has been recommended by NWDA (Parashar –99) under the Himalayan component of National Water Grids proposed for interbasin transfer of water. Bhattacharya and Choudhury (2001) emphasized the need for interbasin transfer of water for development of arid regions. In this paper, author intends to discuss some more details about the scheme and its impact on the overall development of East and North-East region of our country, which is economically backward in spite of its immense natural resources. Brahmaputra-Ganga link is going to benefit the East and North East in particular and the country in general. The proposed link canal connecting a number of rivers is going to be a vital link to connect North-East with rest of the country through the various National Waterways already approved by the Inland Waterways Authority of India established in 1986. Apart from irrigation, hydro-power and navigation, the proposed link is going to partially relieve the region from the devastating flood damages occurring almost every year and bringing loss of life and properties, damaging agricultural lands and crops and subjecting the people to untold miseries and hardships. In fact, one of the principal reasons of backwardness of the area is the flood havoc which is yet to be tackled by the Government of India even after 55 years of independence A master plan is being prepared by the Brahmaputra Board, set up by the Govt. of India, for flood control, hydropower, irrigation and other developments in the North- East.

NATIONAL WATER GRIDS OF INDIA

Although India has vast water resources (estimated as 1869.3 km3 in 20 major basins), the distribution of water is not uniform all over the country mainly due to the extreme variation of rainfall over space and time. While some part of the country is devastated by floods, other parts suffer from drought. Under the National Water Policy (1986), Govt. of India envisaged to transfer water from surplus to deficit areas

by linking the various rivers. Earlier in 1970, Captain Dastur proposed garland and Himalayan canals linking flood prone areas to drought prone areas in India. Subsequently in 1972, Dr. K.L. Rao, the then minister of Water Resources under Pandit Nehru, proposed Ganga-Kavery link. Fig. 3(a) and 3(b) shows the Dastur and Rao's plans. National Water Development Agency(NWDA), set up by the Government of India in 1982 (IWRS 1996) examined these proposals but rejected them as they were found to be unsound, technically not feasible and economically

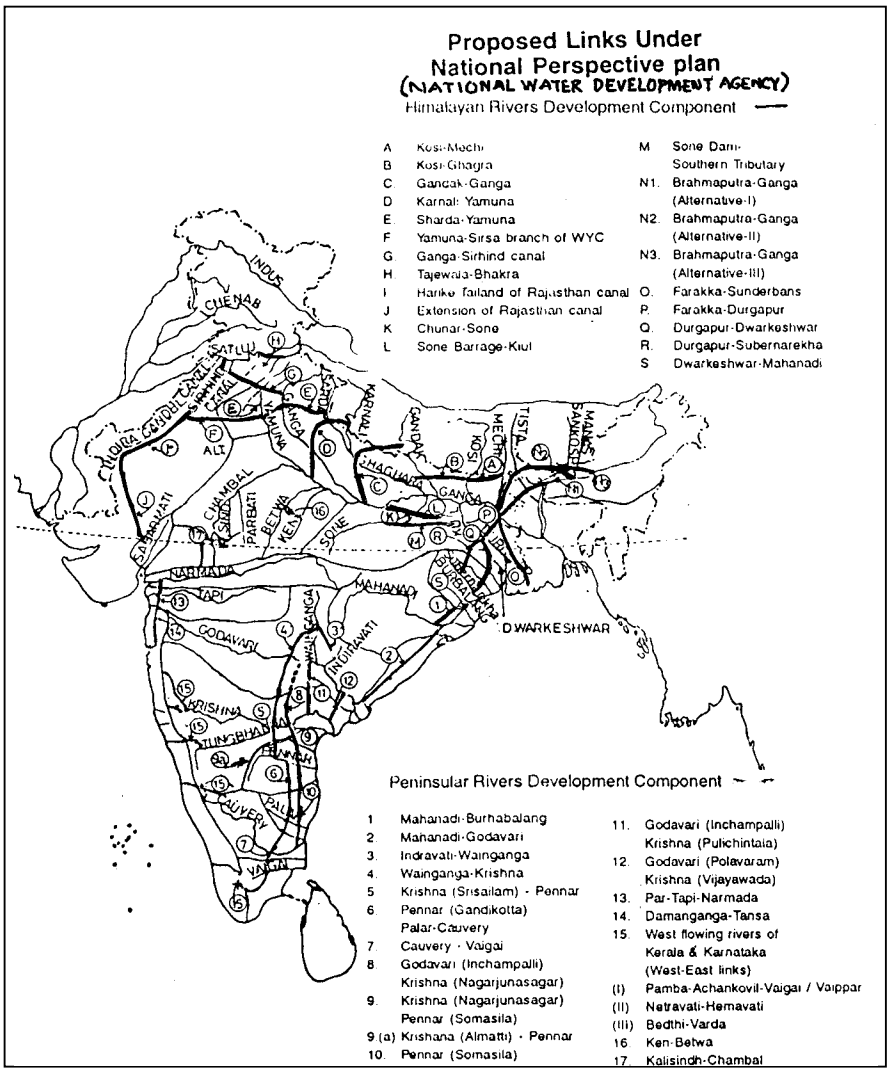

Fig. 2 – National Water Grid of India, Himalayan & Peninsular Components by National Water Development Agency, Govt. of India

not viable. The agency, however, proposed several other links for inter basin transfer of water broadly grouping them under the Himalayan and the peninsular components as shown in Fig. 2. It may be mentioned here that the country possesses the requisite expertise for execution of these schemes since it has already executed the following schemes of interlinking of rivers successfully.

1. Kurnool – Cuddapah Canal in the south executed as early as 1860-70.
2. Periyar-Vaigai link canal in the year 1986
3. Beas-Sutlej link for the transfer of water from Pandoh Dam on Beas to Sutlej river upstream of Bhakra dam.
4. Ravi-Beas link for transfer of water from river Ravi (Madhopur head works) to Beas u/s of Harike and Ferozepur head works.
5. Phase-I of Sutlej-Yamuna link canal connecting Nangal headworks (Sutlej) with Tajewala Headwork (Yamuna River)

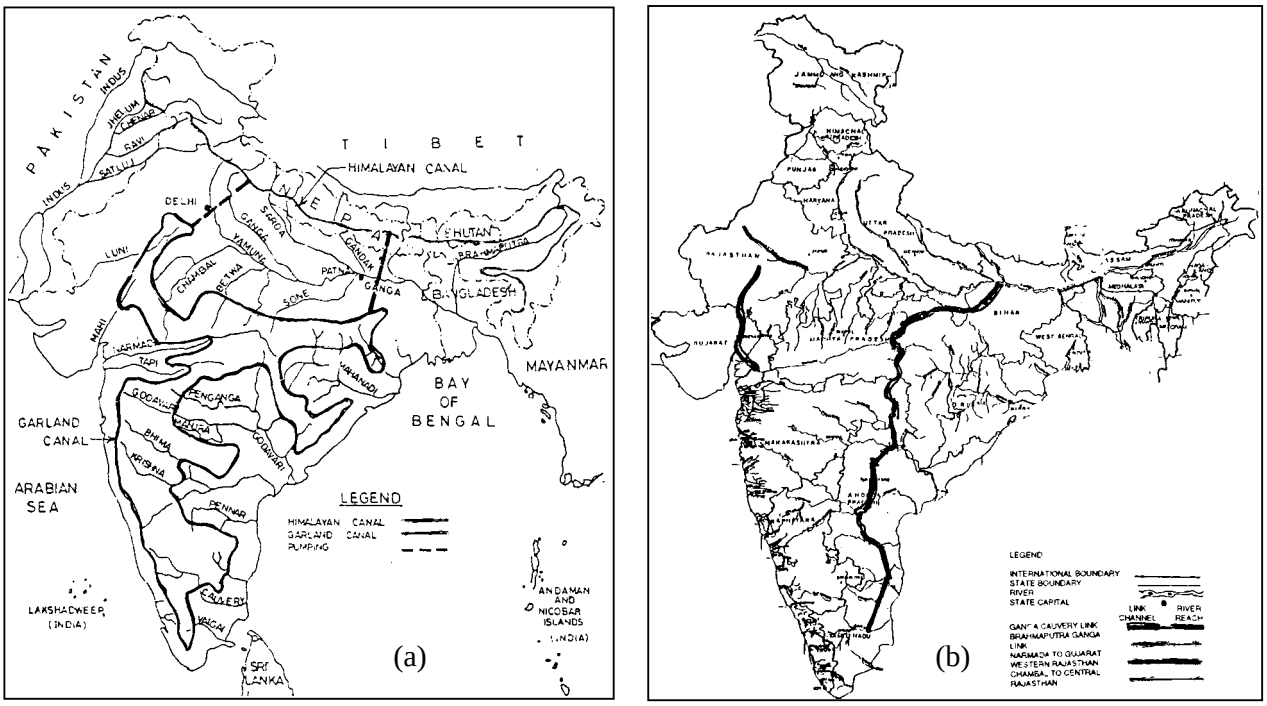

Fig. 3 – National Water Grid of India (a) Captain Dastur's Plan (b) Dr. K. L. Rao's Plan

BRAHMAPUTRA-GANGA LINK

As shown in fig. 2, three alternative routes were explored to link Brahmaputra with Ganga basin. Alternatives I and II (N1 and N2 in fig.2) passes entirely through Indian Territory and are almost the same except the location of diversion points. Alternative III (N_3) is proposed to pass through Bangladesh. Now a sovereign country, Bangladesh may not like to permit Indian canal to pass through its territory. All the three alternatives are proposed to transfer excess water of Brahmaputra basin to a point upstream of Farakka Barrage with a view to meet the seasonal shortage (from February to June) of available flow upstream of Farakka. After the Indo-Bangladesh friendship treaty signed by the former Prime Minister, Deve Gowda of India and Sheikh Hasina of Bangladesh, in the year 1996, 50% of available flow upstream of Farakka Barrage has to be passed to Bangladesh. Originally, the feeder Canal from Farakka Barrage connecting Ganga with Hoogly is designed to convey 1135 cumec of flow in order to help Kolkata Port maintain the navigability of Hoogly. When the incoming flow is less than 2270 cumec, the discharge of Feeder canal reduces and Kolkata Port is not receiving the fresh upland discharge from Ganga to remove the silts getting deposited in the Kokata Port area. For maintaining Kolkata port and the navigability of the National Waterway No. 1 passing through feeder canal, it is essential to maintain a minimum depth of 2 m for movement of vessels. The proposed Brahmaputra-Ganga link is all the more necessary because the available lean period flow in Ganga at Farakka is reducing every year since a large number of multipurpose projects have already been completed in the Ganga basin with storage varying from 10 Mm^3 to 100 Mm^3. Fig. 4 shows a schematic layout of the proposed link, connecting the rivers Manas, Sankosh and Tista in the Brahmaputra basin with Farakka barrage on river Ganga. Fig. 4 also indicates the other links connecting Ganga with Damodar, Subarnarekha, Mahanadi and Godavari rivers for transfer of water from surplus north east to the deficit areas in the south. .

ABOUT GANGA-BRAHMAPUTRA–BARAK BASINS AND THEIR DEVELOPMENT STATUS

The Ganga basin has a catchment area of 8,61,000 sq. km up to Farakka, which is about 26.2% of Geographical area of India. Its catchments comprise of areas belonging to the states of M.P., Rajasthan, Haryana, U.T. of Delhi, Uttaranchal, U.P., Bihar and West Bengal. Ganga originates from Gangotri glacier in Uttarkashi district of Uttaranchal at an elevation of 7010 m and transverses a length of 2525 km

up to its outfall in Bay of Bengal in Bangladesh. Its principal tributaries are Yamuna, Ramganga, Ghagra, Gandak, Chambal, Betwa, Sone, Kosi and Mahananda river. Bhagirathi-Hoogly river system originates from Ganga at about 26 Km d/s of Farakka. Since the mouth of Bhagirathi- Hoogly system near Jangipur was getting silted up and the main flow of Ganga was gradually shifting to Padma in Bangladesh, Govt. of India constructed Farakka Barrage near Malda in 1961 for diversion of 1135 cumec flow to Bhagirathi-Hoogly system through a Feeder canal of about 26 km length extending from Farakka to Jangipur. Without the flow diverted from Farakka barrage, at upper reach of Bhagirathi-Hoogly system would have hardly any dry weather flow and the navigability of the system would be hampered seriously.

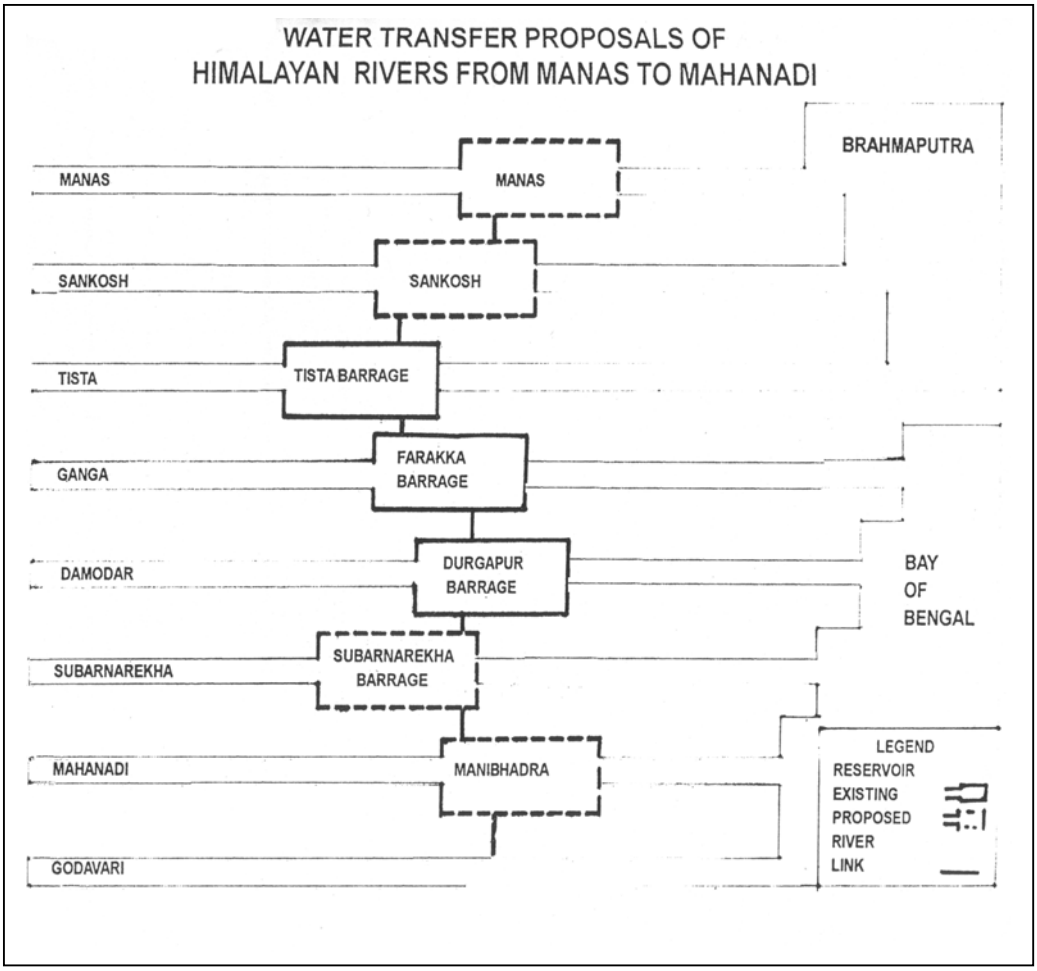

Fig 4 – Proposed Brahmputra – Ganga Link
(Manas-Sankosh-Tista-Farakka-Bhagrathi-Hogli)

Brahmaputra river basin has a drainage area of 1,94,413 sq. km in India which is about 5.9% of geographical area of India. It originates from Manas Sarovar in the Kailash ranges of Himalayas at an elevation of 5150 m and flows 2900 km through Tibet (now in China), India and Bangladesh and joins Ganga in Bangladesh. Principal tributaries of the river in India are Dibang, Luhit, Subansiri, Manas, Sankosh, Torsha, Jaldhaka, Tista, Dhansiri and Champamati.

The Barak basin lying in the States of Meghalaya, Manipur, Mizoram, Assam, Tripura and Nagaland has a total drainage area of 41,723 sq. km., which is 1.38% of the geographical area of India. River Barak originates from Manipur Hills and enters plains near Lakhipur. The river then flows through Bangladesh known as Surma and Kushiyara and later called Meghna, which joins with Ganga and Brahmaputra and discharges into Bay of Bengal. Principal tributaries of Barak are Jiri, Dhaleswari, Singla, Longai, Sonai, Tlwang and Katakhal in India .

Table-3 indicates the status (as in 1999) of Development of Ganga, Brahmaputra and Barak basins.

It is apparent from the table that although there is a phenomenal development of the Ganga basin, hardly there is any development in the Brahmaputra and Barak basins compared to their immense potentials. In spite of verbal assurances of all the past Prime Ministers of India who belong mostly to the Ganga basin, hardly there is any improvement in the Brahmaputra- Barak basin in the north east, compared to the investments made in Indus and Ganga basins and in other river basins in the south and the west. The only course left for correcting the trend lies in, perhaps, an united front of the area who can compel the central Govt. to invest for an all round development of the region which has made so much of sacrifice for the independence of the country.

BENEFITS FROM THE BRAHMAPUTRA – GANGA LINK

Irrigation: The proposed linking of the different rivers as shown in fig.2 and 4 through a network of canals and rivers (e.g. Manas, Sankosh, Tista, Ganga, Damodar, Subarnarekha and Godavari) will provide assured irrigation of about 25 Mha from the barrages and reservoirs in addition to the areas which are already being irrigated from the existing barrages. Additional water available from the Brahmaputra basin will help in the extension of irrigated command under existing barrage and provide irrigation water to the command areas of the new barrages with their own respective river flow as well the additional flow brought from Manas and Sankosh reservoirs and Tista barrage in the Brahmaputra basin.

TABLE-3: DEVELOPMENT STATUS OF GANGA, BRAHMAPUTRA AND BARAK BASINS

S. No.	Item	Ganga Basin	Brahmaputra Basin	Barak Basin
1.	Average annual run-off ($km^{3+)}$	501.64	537.06	59.8
2.	Utilisable surface water (km^3)	250	NA	NA
3.	Utilisable ground water (km^3)	172	20.82	1.33
4.	Number storage scheme of capacity more than 10 Mm^3	248	6	2

5.	Live storage capacity (km^3)	50.8	1.35	0.52
6.	Nos. of major projects with irrigated area more than 10000 Ha	92	3	Nil
7	Irrigation potential created (Mha)	15.36	0.47	Nil
8	Nos. of Hydro power projects			
	(a) No. of identified sites	142	166	32
	(b) Completed and under progress including major multipurpose scheme	50	14	1
9	Hydro power potential at 60% LF (MW)	10715	31062	2042
10	(a) Installed Hydro power capacity (MW)	5153	1126	15
	(b) Installed capacity in % of potential	48%	3.8%	0.73%
11	Nos. of flood forecasting stations (CWC)	77	24	2
12	No. of Gauge discharge sites (CWC)	214	15	23

Hydro Power

The proposed link with its reservoirs, barrages and link canal drops is expected to generate 30000 MW of hydro power at 60% load factor. Proposed reservoirs at Manas and Sankosh will provide sufficient heads for local high head storage plants in addition to low head plants to be integrated with the different barrages where the flow of the parent river and that from the link canals are to be utilized for hydro electric generation. The topographic head of the link canal available at the drops as well as in the remote type hydro plants will be utilized to generate hydro power. The link canal and the reservoirs will ensure firm generation of hydro power which can be utilized for the development of industries in the region.

Flood Control

The proposed link with its reservoir and barrages and its extension up to Godavari basin will cause substantial flood relief in this region due to flood absorption and flow diversion from the excess areas in the North –East to the deficit areas in the south. Any link has to be designed such that the conveying capacity of the interlinked rivers and the canals are adequate. They require proper training and maintenance for their navigability. Soil conservation measures are to be adopted in order to increase the life of reservoirs and navigability of the rivers. All these improvements are going to provide substantial flood relief in the area due to flood control and river training measures.

Navigation

Rail and road mode of transport, especially for bulk commodity over long distance is not only costly, it faces constraints because of land use and environmental factors. India is spending 74% of its export earnings on oil imports. The alternative mode of energy efficient and cost effective inland water transport calls for integrated development of waterways along with roads and railways. Inland Waterways Authority of India (IWAI) set up in 1986 is charged with the responsibility of developing navigation on National Waterways. National Waterways No. 1 and 2, as briefly described underneath are dependent on the proposed Bhahmaputra-Ganga link.

National Waterway No. 1

The Ganga-Bhagirathi-Hoogly river system connecting Haldia-Kolkata-Farakka- Bhagalpur-Munger-Varanasi- Allahabad (about 1620 km long) was declared as National Waterway No. 1 as per National Waterway Act, 1982 (49 of 1982) and was made operational in the year 1986. The endeavour is to provide navigable channel with at least 2 m depth for 330 days in a year. Fixed terminals are available in Kolkata, Pakur and Farakka. Floating terminals exist in Kolkata as well as Haldia, Karagola, Bhagalpur, Munger, Patna and Allahabad. Farakka-Kolkata sector of the waterway comprises of Feeder canal from Farakka Barrage connecting Ganga with Bhagirathi- Hoogly river system. Commissioned in 1975, the feeder canal was designed to convey 1135 cumec of water to the Hoogly system with the primary objective of flushing out sediments from the Kolkata Port area for its navigability. During the lean months from February to June, the available flow in Ganga at Farakka reduces considerably. 50% of dry weather flow is to be released to Bangladesh under the Indo-Bangladesh friendship pact. Thus the flow available for diversion to feeder canal is reduced substantially below the design discharge. For the navigability of the Feeder canal and Bhagirathi-Hoogly river system, it is essential that the feeder canal receive 1135 cumec flow for flushing out of

Kolkata Port on Hoogly river. The proposed Brahmaputra-Ganga link is going to redress these problems by transfer of the required amount of water from Brahmaputra to the Ganga basin, upstream of Farakka barrage.

National Waterway No. 2

The river Brahmaputra connecting Dhubri-Pandu (Guwahati)- Tezpur – Neamati – Dibgrugarh – Sadiya (891 km long) was declared as National Waterway No. 2 in 1988 under the National Waterway Act 1988 (40 of 1988). Endeavour is to provide Navigable channel of minimum 2 m depth under the Agreement with Bangladesh Govt. The Central Inland Water Transport Corporation (CIWTC) and other Indian Vessel operators are plying cargo vessels between Assam and Kolkata making use of IWT transit facilities through Bangladesh. CIWTC, IWT (Assam) and private operators are using National Waterway No. 2 from Kolkata to Dibrugarh. Floating terminals exist at Dhubri, Jogigopoa and Pandu. A scheme for a permanent terminal at Pandu and night navigation facilities between Dhubri and Pandu (280 km) is being implemented. This waterway is connected to National Waterway No. 1 upstream of Farakka barrage. The Brahmaputra – Ganga link is going to develop both the National Waterways (No. 1 and 2) in maintaining the required depth of flow, especially during the lean seasons. Any shortage of water in any of the waterway will be met from the surplus of Brahmaputra basin.

Apart from the above-mentioned benefits, the scheme will be very useful in soil conservation, forestry, fisiculture, drinking water supply, industrial growth, recreation, tourism and host of other benefits for the people majority of whom live in abject poverty now. Needless to mention that the various activities involved in the detailed investigation, planning, construction, operation and maintenance of the scheme and associated other developments will lead to large scale employment of youths of the region who are now unemployed and frustrated.

SUMMARY AND CONCLUSIONS

The proposed link between Brahmaputra and Ganga basins by interlinking Manas, Sankosh, Tista, Ganga, Bhagirathi and Hoogly river system is going to be very useful for the development of East and North-East. Compared to the investments made in the Indus, Ganga and other basins in India, there is hardly any investment in the Ganga-Brahmaputra basins in the east and north-east, in spite of assurances made by almost all the Prime Ministers of India most of whom belong to the north. Immense water resources and hydro-power potential of the region remain practically unused. The proposed Brahmaputra-Ganga link will be helpful not only in the development of irrigation, hydro-power, navigation in the area, it will partially relieve the area from the devastating flood damages occurring almost every year. National Waterway No. 1 and 2, closely related with the proposed link, will provide cheap and cost effective transport from Allahabad to Kolkata and Kolkata to Dibrugarh. The link is going to provide the required flow at Farakka during lean period for diversion to Bhagirathi-Hoogly river system through Farakka feeder canal for flushing out of sediments and keeping Kolkata port healthy. Ultimately, it will help in transfer of excess water of Brahmaputra Basin to the deficient basins in the south and the west.

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