

Tipaimukh Dam of India: Probable Disaster for Bangladesh

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1. INTRODUCTION:

The water disputes between the South Asian Countries provide classic examples of the contentiousness of the issues involved in the management of international river basins. One major cause behind the failure of these countries in finding a comprehensive solution to these disputes is their reluctance to embrace the more recent norms of relevant international law. India and Bangladesh share many rivers and water resources. The rivers including the Brahmaputra and the Barak or their tributaries flowing across the north-eastern regions of India and entering into Bangladesh are mostly international rivers. These two rivers play a vital role for sharing the joys and sorrows of the people of both Bangladesh and India. Since the independence of India, its government has initiated many river projects that have innumerable negative impacts on the socio-economy, environment, agriculture, fisheries, hydrology, ecology etc. of Bangladesh located adjacent of Indian states of Assam, Manipur, Tripura at the downstream of those river projects that has to receive all the development detritus.

Amidst mounting protests both at home and in lower – riparian Bangladesh, India is going ahead with the plan to construct its largest and most controversial 1500 mw hydroelectric dam project on the river Barak at Tipaimukh in the Indian state of Manipur on the common borders of three northeastern states of Assam, Manipur and Mizoram.

In India too, people will have to suffer a lot for this mega project. The total area required for construction including submergence area is 30860 ha of which 20,797 ha is forest land, 1,195 ha is village land, 6,160 ha is horticultural land, and 2,525 ha is agricultural land. As per estimates of the authorities themselves, the project will totally affect 311sq. km and 8 villages, 1461 Hmar families in all. The project will submerge altogether 60 kms of National Highway No 53, the only alternative lifeline to NH-39 at three different points with two major bridges. The main sources of livelihood of the people are agriculture and horticulture. With the construction of Tipaimukh high dam more than 67 villages will be deprived of their source of livelihood.

Experts in the capital city of Bangladesh, Dhaka are afraid of the

unilateral Indian movement for construction of the massive dam and regulate water flow of the river Barak that will have long adverse effects on the river system of Surma and Kushiara in the north-eastern region of Bangladesh which will obviously have negative impacts on ecology, environment, agriculture, bio-diversity, fisheries, socio-economy etc. of Bangladesh.

The river Barak has entered into Bangladesh through Zakiganj in Sylhet and is flowing into two directions - Surma and Kushiara. 'The Timpaimukh Dam will choke up the Surma and Kushiara rivers during the dry season and leave similar effect on Bangladesh as the Farakka Barrage is doing', In a study made by Bangladesh Water Development Board (BWDB) noted that obstruction to the natural flow of the Surma and Kushiara will seriously hamper hydrology, agriculture etc. in at least seven districts of Sylhet, Moulvibazar, Habiganj, Sunamganj, Brahmanbaria, Kishoreganj and Netrokona in Bangladesh that produce bulk of the country's rice crop.

The Barak and its main tributaries river Surma and Kushiara fall within the Meghna basin, member of one of the world's most dynamic and diversified hydrologic basin trio- Ganges-Brahmaputra-Meghna (GBM) river system. The total drainage area of the GBM region is about 1.75 million sq. km-stretching across five countries: Bangladesh, Bhutan, China, India and Nepal, of which Meghna basin is the smallest but most unpredictable and chaotic in hydrologic means. Barak and then Surma, Kushiara river receive all the surface water originated in Meghna basin, carry down to the upper Meghna River, and join with Padma river at farther downstream. Combined flow then move further southward naming Lower Meghna or Meghna river to Bay of Bengal. Now, proposed Tipaimukh Dam will be constructed on the Barak river by controlling the stream flow of it, create a huge reservoir upstream of the dam to develop one of largest hydroelectric power plant in the eastern India. The dam site is located at around 100 km upstream from the diverging point of the Barak river into two rivers where Surma-Kushiara are the main tributary channels in the north-eastern part of Bangladesh.

Meanwhile, experts in Bangladesh have expressed their apprehension about the Tipaimukh Dam project that will surely to block the flow of the country's major riverine networks in the north-east region and will have further disastrous consequences at the downstream. They claim that it could hit the country fatally, or have consequences of no less magnitude than the Farakka Barrage constructed across the Ganges in

the north-west of Bangladesh. After completion of the project, Bangladesh would get less water in three rivers-the Meghna, the Surma and the Kushiara,

So it was felt that a study in this regard would be useful to assess the plausible impacts of Tipaimukh Dam. The study was conducted with the objectives: (i) to assess the plausible impacts of Tipaimukh Dam on the environment and socio-economical conditions of the people of Bangladesh. (ii) to make recommendations and suggest remedial measures to minimize the negative impacts of Tipaimukh Dam.

2. LITERATURE REVIEW:

Based on different journals, books, seminar papers, reports, magazines etc. the literature review was made.

2.1 Study Area: The Study area covers a gross area of 335,600 ha between latitude 24°56' and 24° 15' N and longitude 92°05' and 90°55'E. It extends over the districts of Sylhet, Sunamganj, Moulavibazar, Habiganj and Kishoreganj in Bangladesh. The study area is bounded by the Kushiara-Bijna-Ratna-Sutang River system on the south, the old Surma-Dahuka River system and Jagannathpur-Sylliet road on the north, old Surma-Baulai River system on the west, and the Sylhet-Kaktai village road on the east.

The area generally experiences the sub-tropical monsoon climate due to variation of its location and topography. Mean annual rainfall increases from an average of 2,572 mm/year in the south (at Habiganj) to 5,641 mm/year (at Sunamganj) in the north, or by 119% across the project area. This increase is mainly attributable to the presence of the Shillong Plateau to the north. The mean annual rainfalls during the period 1961-90 were 10% greater than those during the period 1901-30. The annual rainfalls during the period 1961-90 were 1.95 times as variable as those during the period 1901-30. It is possible that the indicated trends may reflect only a rise to the peak of some long-term climatic cycle, but they may reflect a monoclinal rise due to global climatic change. However, caution should be exercised in interpreting these results, due to the relatively high proportion of synthetic data. Maximum temperature varies from 27.6°C to 35.0°C. The highest temperatures are experienced during the pre-monsoon period. Daily minimum temperature can fluctuate significantly during the year ranging from 9 °C to 23 °C. (NERP, 1995).

The land in the study area is generally low-lying and of low relief. The landforms in the study area have formed as a result of alluvial sediment deposition on a slowly subsiding tectonic basin. Consequently, most of the area is underlain by Holocene-age alluvial, estuarine and lacustrine deposits. The study area is comprised of three main physiographic units: uplands, lowlands floodplain and flood basins (GSB, 1990 and Rashid, 1991). Uplands cover about 1 % of the study area and are located in the northeast. They are comprised of merging alluvial fans that slope gently outwards from the foothills.

The lowland floodplain comprises about 34%, or 1,137 km² of the study area. The floodplain contain channel deposits such as meander scrolls and fills, over bank deposits such as natural levees and crevasse splays, flood basin and back-channel deposits. Flood basins cover about 65% of the study area. This physiographic unit is characterized by large, saucer-shaped depressions known as *haors*. *Haor* land is generally very low-lying and often contains permanent water bodies or heels. During the monsoon season, all of the *haor* areas are deeply flooded. The *haors* comprise the prime agricultural land of the study area, but seasonal inundation is a constraint to agriculture. In most areas only the born (dry season) rice crop can be grown, but this is liable to flood damage in the pre-monsoon season. *Haors* and beefs are also important habitat for fish and other wildlife.

The area occupies five agro-ecological zones (AEZ): the Old Meghna Estuarine Floodplain (AEZ 19), Eastern Surma-Kushiyara Floodplain (AEZ 20), Sylhet Basin (AEZ 21), Northern and Eastern Piedmont Plains (AEZ 22), and Northern and Eastern Hill (AEZ 29). All the zones excepting AEZ 20 are divided into sub-zones. The sub-zones are differentiated by relief and flooding characteristics.

Nine general soil types occur in the study area: Non-calcareous dark Grey Floodplain, Noncalcareous Grey Floodplain and Acid Basin Clays are their major components. Non-calcareous Dark Grey Floodplain predominates in the southwestern part, Acid Basin Clays in central-southern part, and Non-calcareous Grey Floodplain in the western, northern, and eastern parts. Varying proportions of Non-calcareous Alluvium, Peat, Non-calcareous Brown Floodplain Soils, Grey Piedmont Soils, Brown Hills Soil, and Deep Grey Terrace Soils occur in the project area.

Table 1: Land use pattern in the study area

Table 1 shows the current land use patterns in the study area. These values are based on NERP's 1995 land-use survey and sub-district maps compiled from spot imagery (1989-90), aerial photographs (198384), and topographic maps made by the Local Government Engineering Department (LGED) in 1994 under a UNDP/ILO project. The land-use survey was carried out at 10 sample sites, and the information was recorded on mauza maps at a scale 1:3,960.

Land Use	Area (ha)
Cultivated Laud	279,550
Settle Lela	14,779
Beels	13,340
Rivers	10,780
Calallilels	1,250
Ponds	2,466
Infrastructure	2,491
Klws/Grass kind	10,6411
Total	335,600

The Surma-Kushiyara River system originates from the Barak River in India. The Barak River drains 25,260 km² of land in the states of Assam, Manipur and Mizoram and crosses into Bangladesh near Amalshid. At Amalshid it splits into the northward-flowing Surma River and the southward-flowing Kushiyara River. Below Amalshid, the river undergoes several name changes along its course. For convenience, all locations along the river have been referenced to a chainage. The chainage is measured along the river centerline, and starts from the BWDB gauge on the Meghna River at Bhairab Bazar.

Based on water balance studies, the long-term discharge from the Barak River at Amalshid is 1,130 m³/s, with the flow into the Kushiyara branch amounting to 656 m³/s. The mean daily discharge increases to 1,100 m³/s at Sherpur, and reaches 1,534 m³/s in the lower Dhaleswari River at its junction with the Baulai River. The contribution from the Kalni-Kushiyara River amounts to 27% of the total flow in the Upper Meghna River at Bhairab Bazar.

Each year a tremendous volume of sediment enters the Kalni-Kushiyara River. As a result, the Kalni-Kushiyara navigation channel has deteriorated from a class I perennial navigation route, which it was in the early 1960, to a class IV seasonal river route. The river bed contains many shoaled patches.

2.2 Impacts of Dam: While wide variations occur from site to site, the environmental impacts of dams can generally fit within two categories: those due to existence of the dam and reservoir; and those due to the pattern of dam operation.

Impacts due to existence of dam and reservoir:

1. Imposition of a reservoir in place of a river valley (loss of habitat)
2. Changes in downstream morphology of riverbed, delta, and coastline due to altered sediment load (increased erosion).]
3. Changes in downstream water quality: effects on river temperature, nutrient load, turbidity, dissolved gases, concentration of heavy metals and minerals.
4. Reduction of biodiversity due to blocking of movement of organism (e.g. salmon) & because of above changes.

Impacts due to pattern of dam operation:

1. Changes in downstream hydrology:
 - a) Changes in total flows
 - b) Change in seasonal flows
 - c) Short-term fluctuation in flows
 - d) Change in extreme high and low flows.
2. Changes in downstream morphology & water quality caused by altered flow pattern.
3. Reduction in riverine/riparian/floodplain habitat diversity, especially because of elimination of floods.

Dams also have a range of social impacts such as relocation of communities, loss of community control over water, diseases, increasing economic inequalities: disproportionate share of project benefits usually go to wealthier sectors of society. However, the creation of reservoirs is not without costs and impacts of the followings: groundwater effects, landscape destruction, destruction of fish habitat and fisheries contamination of food chain with methyl mercury and other contaminants, increased epidemics, green house gas pollution, changes to climate, changes to the global environment: change in speed of earth's rotation, changes to the shape of the earth's magnetic field, destruction all upstream and downstream ecosystem, destruction of deltas and wetlands critical to migrating wildlife, changes to coastal ecology & extinction of some flora & fauna.

2.3 Proposed Tipaimukh Dam: The proposed Tipaimukh dam will be constructed 500 m downstream from the confluence of the Barak and the Tuivai rivers in the southwestern corner of Manipur (24°14' N and 93°1.3' E approximately). The location of the Dam is shown in figure- 1. The river Barak is the second largest drainage system in northeast India. It starts from the Lai-Lyai village in Senapati district of Manipur and meanders through the Senapati, Tamenglong Churachandpur districts and also through the Jiribam subdivision of Manipur. The

upper Barak catchments area extends over almost the entire north, north-western, western and southwestern portion of the state.

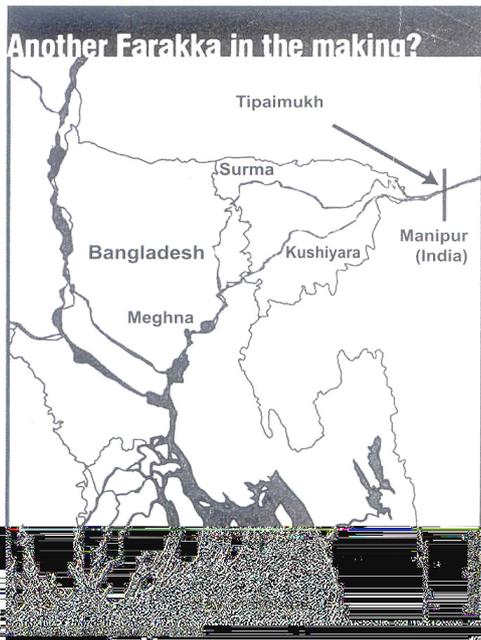


Figure 1: Location map of Tipaimukh Dam.

The middle course lies in the plain areas of Cachar of Assam, while the lower, deltaic course is in Bangladesh. The Barak valley is the natural flooding plain of the Barak River. Floods are frequent in the Barak drainage system and part of the natural cycle. In an attempt to control frequent flooding in the lower Barak plain, several proposals to dam the Barak river have been raised within government and political circles since pre-independence days. In 1954, the Assam government requested the Central

Water Commission (CWC) and the Planning Commission to identify a suitable location where the monsoon waters of the Barak could be impounded to form an artificial flooding zone. Accordingly, the North-Eastern Council (NEC) entrusted the investigation work to the CWC. The CWC submitted their report in 1984, which proposed the construction of the Tipaimukh high dam. However the report was turned down for the lack of proper environmental impact assessment of the submergible areas. Again, in 1995, at the request of the NEC, the Brahmaputra Board prepared the Detailed Project Report. There was no progress after this. Finally, in 1999, the Brahmaputra Board handed over the project to the Northeast Electric Power Corporation Limited (NEEPCO). On January 18, 2003; the project received the all-important notification under section 29 of the Electricity Act. And at last Manmohan Singh, the Indian Prime Minister was scheduled to lay the foundation stone of the Tipaimukh dam on November 23, 2004. It was known from the report reaching from across the border the Indian Prime Minister Manmohan Singh inaugurated the Tipaimukh Dam recently on the river Barak in Manipur, about 25 km from the Zakiganj border of Sylhet (Kibria and Laifungbam, 2003),

The dam would be an earthen – rock filled dam to be constructed with the length of 390 m and height 162.8 m at an altitude of about 180 m above mean sea level with a maximum reservoir level of 178m. The

dam was originally designed to contain floodwaters in the lower Barak valley but hydropower generation was later incorporated into the project. The project will have an installation capacity of $6 \times 250 = 1500$ MW and a firm generation of 412 MW. The dam would be completed by the year 2012 at a cost of Rs 4000 crores. The total area required for construction including submergence area is 30860 ha of which 20,797 ha = forest land, 1,195 ha = village land, 6,160 ha = horticultural land, and 2,525 ha = agricultural land. As per estimates of the authorities themselves, the project will totally affect 311 sq. km and 8 villages, 1461 Hmar families in all. The projective date of completion is the year of 2012 & implementing agencies are North-Eastern Electronic Power Co-operation (NEEPCO). The project cost estimated by the NEEPCO is Rs. 5225.70 Crore. It was reported in 2005 that the revised cost of the project was Rs 6351 crore.

2.4 People's perception regarding the Tipaimukh dam: The residents of the Indian north-eastern states who are likely to be displaced and affected on account of the project have been staging protest and making representations to their respective state and the union governments, saying that thousands of people will suffer as the construction of the dam will submerged 73 villages, many sacred sites and cultivable land and violate their inalienable human rights. The people of the localities where the dam is proposed to be built have sought constitutional protection, particularly with view to safeguarding the tribal people, their land, belief, culture and history. Expressing grave concern over the possible consequences of the dam, the protestors said in a recent memorandum submitted to the central government of India, "Once the dam is built, the land, covering an area of 275.5 sq km, will be submerged permanently".

Dr Roy Laifungbam, the chief of the Imphal based Center for Organization, Research and Education, noted that the Tipaimukh dam would cause a disaster in Manipur while parts of Assam, particularly its Kachar district would also be affected while it would also have a marginal negative impact on Mizoram. India is set to build the Tipaimukh dam on the tri-junction of Manipur, Mizoram and Assam, on the river Barak with the declared objective of power generation. Roy said the entire valley and its cultural sites, ancestral spiritual, and holy places would go under water denying the people of their cultural roots and identity of thousands of years. "This will be cultural destruction," he said. The indigenous people, rooted to the land, would be displaced, he apprehended. He said that normal life in Manipur was bound to be completely disrupted by the Tipaimukh dam as about 12,000 square

kilometers of Manipur, out of the total area 22,000 square kilometers, forms the Barak catchments. "What we ask for we do not get, we get we do not want," he said. The people of Manipur do not want the dam, as they do not need it, he argued saying that Manipur does not have industries to need such a big hydro project. Rather, he said, the people of Manipur need micro projects that would generate employment and solve their problems. But over the last 55 years the demand of the people remained unmet for the last 55 years, he said.

The public hearing conducted by the Mizoram pollution control board last week over Tipaimukh dam project has not gone in favour of the dam as the people to be affected have strongly objected to it. The MPCB, in a report about the hearing, bluntly stated that people and organizations that attended the hearing objected to the dam. Secretary of the board, when contacted today, said the people to be affected by the dam on the Mizoram side were not satisfied with the rehabilitation and implementing agency, NEEPCO and could not, therefore, agree to the dam coming up. "The affected people and the organizations that came for the public hearing were not satisfied with NEEPCO's plans for their rehabilitation and compensation. They also said they wanted free power as well for which NEEPCO did not seem to have an answer, Lalduhawma, the MPCB secretary, said. The report stated that in view of the objections voiced by the people, it was difficult to come to a conclusion. "The discussion made at the hearing was that a workable compromise be arrived at a meeting of the three parties involved-the people living in the affected area. In the government of Mizoram and NEEPCO," the report said.

One interested party, which came for the hearing was the Human Rights Network of Indigenous People North East Chapter who vehemently opposed to the dam saying it was in contravention to the Indian Constitution where tribal and their lands were protected. They said they can never agree to projects where the rights of the people are violated and would rather forego development if these rights are to be ignored. Latest information on the proposed dam has it that no public hearing has yet been initiated on the Manipur side which 90 percent of the project would affect. In any case, there has been opposition from the people on the Manipur side for the Rs 5163 crore, 1500 MW project right from the onset and a public hearing in Manipur would also arrive at the same conclusion as it did in Mizoram.

K.Hawla Sailo, secretary of the Human Rights Network of Indigenous People NE Chapter said they would oppose any development in the

North East that would adversely affect the indigenous people. he said today that the norms being applied for development projects, specially hydroelectricity, at the national and central government level does not take into account Article 46 of the Indian constitution which seeks to “protect (the weaker sections of the people) from social injustice and all forms of exploitations”.

“The central government needs to change the norms that have overall application totally do not take into account the safeguards provided to scheduled castes and by the constitution” he said.

3. METHODOLOGY:

The methodology of this study includes several techniques like literature review, unstructured-semi structured interview, structured and in-depth interview, focus group discussions, quantitative data collection, data analysis, report writing and presentation. Several tools like checklists, structured questionnaire, satellite image, software etc. were utilized for the above mentioned techniques.

Conceptualization and literature review were made by communication with the resource persons, and literature review was made based on different journals, books, seminar papers, reports, magazines etc. that focused on the issues related to the present topic. After setting the objectives of the study to reach the terminate point, a mental model was made that was the setting of thinking for achieving the goal of the study sequentially. Unstructured-semi structured interview was made by a flexibility of approach to questioning. The interviews did not follow a system of pre-determined questions and standardized techniques of recording information. The researcher was allowed to have greater freedom to ask, in case of need, supplementary questions or at times the interviewer omitted certain questions if the situation so requires. He even changed the sequence of questions. Structured and in-depth interview were conducted by the use of a set of pre-determined questions and of highly standardized techniques of recording. A rigid procedure laid down, asking questions in a form and ordered prescribed.

During FGDs, interviews were held with the people selected randomly from different occupations. With the help of questionnaire, questions and queries were made for collection of necessary data and information on positive and negative impacts of Tipaimukh Dam on environment and livelihood of the people of the project area. The FGDs

were conducted with the people of Sylhet, Moulvibazar, Habiganj, and Sunamganj. Water and environmental experts, lawyers and other elite were interviewed for collection of qualitative data and information. Quantitative data were collected from the relevant organizations like Bangladesh Water Development Board (BWDB), Local Government Engineering Department (LGED), The World Conservation Union, Bureau of Disaster Management and Relief, Centre for Environmental and Geographic Information Services, Institute of Water Modeling, Institute of Water and Flood Management, Bangladesh Environmental Lawyers Association, Bangladesh Rice Research Institute, Bangladesh Agricultural Research Council, Surface Water Modeling Centre and others as per required.

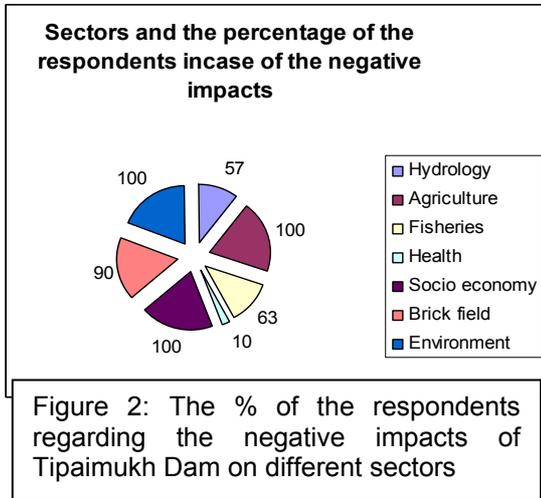
Satellite image, digital map and different software (MS Word, MS Excel and SPSS) were utilized-For finding out the location of the Tipaimukh Dam & to find out the Surma-Kushiyara river system through Bangladesh and to determine the more vulnerable area of Surma-Kushiyara catchments region.

All the collected data and information were compiled, analyzed and interpreted using different statistical formulae. The negative impacts of Tipaimukh Dam were assessed on environmental and socio-economical conditions of the people of the region. The relevant information has presented into tabular forms and important and interesting ones were depicted in graphs and figures. On the basis of the analyses of data and information, conclusions and recommendations were made.

4. RESULTS & DISCUSSIONS:

4.1 Impacts of proposed Tipaimukh Dam: Questionnaire survey was carried out among the people of sylhet, Habiganj, Sunamganj, Kishoregonj and Moulvibazar who would be affected vastly due to the creation of Tipaimukh dam. Interviews were held with 50 farmers, 20 fishermen and 30 people of different occupations to collect data and information. To identify the plausible impact of Tipaimukh dam data and information were collected on the agricultural, fisheries, brick field and socio economic conditions of the people of the surroundings regions. Most of the respondent thinks that it would have vast negative impacts on the environment and livelihood in Bangladesh.

The percentage of the respondents regarding the negative impacts of Tipaimukh Dam on different sectors is shown in figure -2.



The proposed dam would be subject to severe hydrological impact due to the lack of water flow through the river system in Bangladesh. Water level in the hand tube wells, shallow tube wells and ponds would be lower than the present.

Among the respondents 57% reported that there would have no positive impacts on Bangladesh due to the construction of this dam. The respondents who reported the

negative impacts were asked the question: in what spheres of the hydrological sector the negative impacts of the dam would be observed? The percentage of the respondents regarding negative impacts on different sectors of hydrology is shown in table 2.

Table 2: The percentage of the respondents regarding negative impacts on different sectors of hydrology

Serial No.	Area of negative impact	% of respondents
1	Flood during rainy season	85
2	Less water flow in the river system of Bangladesh during dry season	100
3	Non-availability of water for agriculture in Bangladesh	87

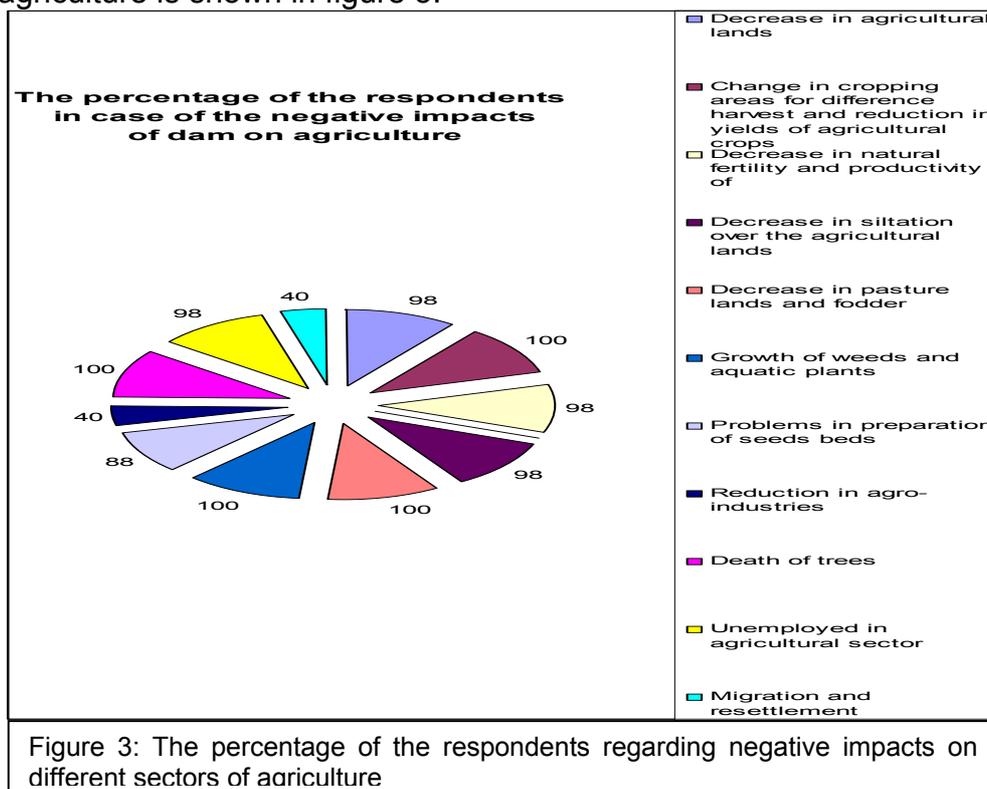
Source: Field survey 2005

Among the respondents 85% reported the occurrence of flood in the months of the July-September every year as because during the rainy season, India will not block the water. So in that time, amount of water would be much more than the river's water holding capacity. So over flow would take place. As a result flood would be happened.

Due to the decrease of water flow in the river system, siltation process will also be continued resulting in desertification of the river networks.

Earlier it was mentioned that 100% of the respondents reported the negative impacts of the Tipaimukh dam. To collect data and information and to assess the negative impacts, the respondents who reported the negative impacts were asked the questions: "In what spheres of the agricultural sector, the negative impacts of the

Tipaimukh dam would be observed?”. The percentage of the respondents regarding negative impacts on different sectors of agriculture is shown in figure 3.



Most of the respondents reported that most of the area of the northeastern part of the country would be affected with the construction of this dam respectively for the months of July-December and January-June. The net cropping area would be drainage congested and consequently the cultivable area will decrease within a few years. They also reported that the change in cropping areas for harvests and reduction in agricultural yields would be happened due to Tipaimukh dam. 98% of the respondents opined that natural fertility and productivity of agricultural lands will decrease due to less water flow. 80% of the respondent's opined that the yields of agricultural crops would be significantly reduced due to non-siltation of their lands after the construction of Tipaimukh dam.

All of the respondents reported that the pasture lands and fodder for their cattle will decrease & they will have to face problems with their cattle due to shortage of fodder. The reason for the decrease in pasturelands can be attributed to drainage congestion and sudden floods reported by 94% and 52% of the respondents. The shortage and

increase in value of straw, husk, bran etc. due to decrease of production of rice wheat, gram, pulses etc reported by 96%, shortage in production of mustard and increase in value of oil-cake reported by 93% of the respondents & 40% reported that agro industries due to less yields will decrease.

According to 98% of the respondents, unemployment problems would have increase in the agricultural sector after the construction of the Tipaimukh dam. Regarding the causes of increase of unemployment in the agricultural sector, the respondents opined that the farmers/house holders would economically insolvent, as they will not be able to cultivate their lands properly. As a result their yields will be reduced. The farmers will no be able to cultivate their lands due to unavailability of water and the high cost for irrigation reported by 87% of the respondents.

Among the respondents, 63% reported the negative impacts of Tipaimukh dam in fisheries sector of the study region. The respondents who were in favor of the negative impacts were asked the question: "In what spheres of the fisheries sector the negative impacts of Tipaimukh dam would be observed?". All of the respondents informed that due to the decrease in the water flow and water bodies, obviously the fisheries productions would be less. Some of the respondents reported that the fish diseases due to drainage congestion that may be happened if the proposed dam is built. The fishes would be generally attacked with diseases (locally called cancer) if the reduction of flow exists.

Impact of an existing or a new situation, developed by either natural process or artificial interventions, on socio-economical conditions of a specified area, region or country and its population can be evaluated by some drivers on indications. In the very recently formulated National Water Management Plan (NWMP, 2001) the main social and economical imperatives that have been taken into consideration are: population growth, urbanization, poverty alleviation, economic growth and development, employment generation, education and public health, food security agricultural land availability water availability for irrigation. Institute of Flood control and Drainage Research (IFCDR, 1992) used four indications for the assessment of socio-economical conditions in size flood control, drainage and irrigation project in Bangladesh. The indications were: House hold situation (annual house hold income, occupation, education), level of living standard (housing condition ,latrine condition, drinking water source ,health care facilities), land holding and tenancy (land ownership and farm size, land

tenure system), and institutional Participation.

Considering the importance and relevance of the above indications to the present study as well as the case of field data collection through questionnaire survey of local people, plausible impacts of the Tipaimukh dam which is going to be constructed has been assessed by evaluating the following indications: Employment and income of farmers and fishermen, infrastructural conditions, level of education, living and land ownership of the people and occupation of the people of the study area.

The land people of the study area were interviewed about their thinking related to the plausible impacts of the Tipaimukh dam on socio-economical conditions of the people of the study area. 100% of the respondents reported the negative impacts of dam on socio-economical conditions of the people of the region. To collect more data and information the respondents regarding negative impacts were asked the question: "In what spheres of the socio-economical sector the negative impacts of the proposed dam would be observed?" The percentage of the respondents regarding negative impacts on different sectors of socio-economy is shown in table 3.

Table 3: The percentage of the respondents regarding negative impacts on different sectors of socio-economy

Serial no	Area of negative	Percentage* of respondents
1	Decrease in employment opportunity in agricultural sector	100
2	Decrease in income of the farmer	100
3	Damage of residential area and other institution.	100
4	Change in occupation	96
5	Difficulties in schooling of the children	100
6	Change in land ownership	94
7	Change in living standard	100

* Multiple responses were considered

100% of the people interviewed reported that the land area would be affected by the construction of Tipaimukh dam. So net crop area would be decreased and the yields of the agricultural crops also would be less. Thus, the farmers will be economically insolvent and will not be able to employ required number of laborers in their agricultural activities for cultivating, harrowing and harvesting. So the employment

opportunity will decrease of the region. Thus the income of the farmers will decrease. 96% of the respondents reported the Change in occupation would be happened .The net crop land area would be decreased; the yields of the agricultural crops also would be decreased. Consequently, the farmer will become poorer. So, some of the poor farmers will change the farming profession and will accept the others.

There is a realization that hydroelectric power projects are not as clean as they were normally considered to be world over. They cause many adverse environmental and social impacts. A major conflict arises between development and biodiversity conservation when projects are located in the wilderness area because such projects impact upon prevailing patterns of allocation of land and resources to people and interface with various forestry and wildlife conservation objectives. The plausible environmental impacts may be happened if the proposed dam is built are mentioned in a nutshell below:

Environmental impacts: The change in the climate condition of the project site, the sitting of flowing waters leading to temperature stratification, the project activities leave the eco-impact features of instability in the form of landslides and soil erosion, violent disturbance of pristine areas, variation in water table, instability of geo-physical landscapes, siltation and nutrients variation, decrease flow-rate of the river down stream- affects aquatic life and riparian communities, reduced capacity for self regeneration, reduced recharge of ground-water aquifers, enhanced pollution levels etc, submergence of land, air pollution, solid waste problem, enhance seismic activities due to pressure of water. The huge amount of water reservoir cause tremendous pressure to the earth region and the Tibetan plateau region, having hazard levels of the order of 0.25g with prominent highs of the order of 0.35-0.4g in the seismically active zones of the Burmese arc. North-eastern India and North-west Himalaya/Hindukush regions are included in the zone.

The biological impacts: Loss of vegetable cover: removal of the plants from the project site, reduction in bio-diversity, decrease in the faunal species: the disturbance caused in the nature, deforestation, threat to medicinal plants due to submergence, disturbance, de-stabilization, and degradation of land. Soil erosion and floods in and around the dam site has its indirect influence on plant.

Impacts on Socio-economic environment:

- a Problems of host communities such compensation, employment, road construction, drinking water, afforestation to compensate the loss resulted due to the development works.
- b Public agitations: due to misunderstanding between the host communities and the managing authorities cause campaigns and strikes against the authorities to make agree the project proponents to meet their demands. All these reactions of resentment ultimately affect production rates and its growth, ultimately hampering the growth of the country.
- c Irrigation from hydro-power projects has numerous impacts, on forest and wildlife directly or indirectly, thus affecting the socio-economic condition of the host communities.
- d Multi-purpose projects often have only two components namely, irrigation and hydroelectric power. The integration of other purpose has not been a standard feature of project planning.
- e Project-affected persons with the assistance of NGO have become more conscious of their rights both their fundamental rights as citizens and their traditional rights of use of rivers waters, forest produce and other natural resources.
- f The Tipaimukh area is ecologically sensitive and topographically fragile. Some of these negative effects cannot be remedied or even mitigated; and in some causes efforts to mitigate or compensate for environmental impacts in turn will create further problems.

Demerits at a glance:

- (i) The construction of dam will directly affect the livelihood of the people of north-eastern state of India as well as on the people of Bangladesh
- (ii) Consequent displacement and destruction of the people by implementing the project will pose a grave threat to the vibrant democratic system of people's right to live.
- (iii) The project once installed will submerge the exotic flora and fauna and rich gene pools as Manipur falls under one of the genetic hot spot zones of the world where rare biodiversity resources exist.
- (iv) There will be problem in displacement, resettlement, and rehabilitation and development issues.
- (v) The construction of dam will be a violation of

fundamental rights to live in any part of India and right to protect the land as a residence of that particular area.

- (vi) It is totally a disregard of Zeliangrong ancient indigenous heritage.
- (vii) Not only the basin of Barak will be affected, it will also affect to its tributaries.
- (viii) The livelihood of people of north-eastern districts of Bangladesh will be under the mercy of the outsiders.

The names of the regions of India to be affected due to the construction of Tipaimukh Dam are shown in table 4.

Table 4: The names of the region (of India) to be affected due to the construction of Tipaimukh Dam.

Sl. No	Name of Region	Tribe	Remarks	Name of Dist.
1.	Vanchingthai	Hmar	Partially	Tamenglong
2.	Bangaijang	Rongmei	Partially	
3.	New Thiulon	rongmei	Partially	
4.	Taiijiang	Rongmei	Partially	
5.	Seikjang	Kuki	Submerged	
6.	New Chingkao	Rongmei	Partially	
7.	Hmarkhawpui	Hmar	Submerged	Churachand pur
8.	Sitam	Hmar	Submerged	

4.2 Experts views regarding the Tipaimukh Dam: Experts views regarding the construction of Tipaimukh Dam are enlisted in table 5.

Table 5: Experts views regarding the construction of Tipaimukh Dam

Sl no.	Name and address	Comments and views
1	Dr. Sudhirendar Sharma Staff, The New Delhi Ecological Foundation, India.	According to him, due to the creation of Tipaimukh dam, not only Bangladesh India will be affected and it would have vast negative impacts on environment and livelihood in India.
2	Dr. Zahurul Islam Professor, Institute of Water and Flood Management, BUET. Bangladesh.	He says, the Tipaimukh dam would have severe impact on Bangladesh environment. Change in morphology of north-eastern region of the country &

		Change in water quality & Reduction of bio-diversity would be happened..
3	AKM Shamsul Haque X- chairman Bangladesh Water Development Board (BWDB), Bangladesh.	It would have negative impacts on flora and fauna and especially on fisheries also. Negative impacts may have on brickfield also.
4	Nazmul Haque President Sylhet Disater Forum, Sylhet, Bangladesh.	He says, already, at present, Surma and Kushiara river is not getting sufficient water. So if it is done, it would be a welcome for another desertification process for north-eastern part of the country.

4.3 Violation of International Law: The Tipaimukh Dam project was entirely developed and approved without once informing the government of Bangladesh or involving its people in any meaningful exercise to assess the downstream impacts of the Dam. This is clearly a gross violation of co-riparian rights of Bangladesh.

Violation of UN Water Course Convention 1997: The 1997 UN Watercourse Convention is the only convention of a universal character on utilization of the international water courses. It was negotiated by almost every member of the international community including Bangladesh and India and was adopted by a very weighty majority of States. The convention sets forth the general principles and rules governing non-navigational uses of international watercourses in the absence of specific agreements among the States concerned and provides guidelines for the negotiation of future agreements (UN press Release, GA/9248).

India has even disregarded some major provisions of the 1997 UN Watercourse Convention (Islam, M.N; 1999) which are mentioned below:

Equitable Utilization: Article 5(1) of the convention requires an international watercourse to be utilized in an 'equitable and reasonable manner'. The objectives are to attain 'Optimal and sustainable utilization' as well as to ensure 'adequate protection of the watercourse'. While achieving these objectives, according to Article 6(1), conservation protection, development and economy of use of the water resources have to be taken into account. The incorporation of

conservation aspects enjoins the watercourse states with greater responsibility, which the negotiating states considered appropriate in view of the recent development of international environmental law (UN GAOR, 51st Session, Sixth Committee; Summary record of the 24th meeting, 17/10/96,p-04).

No - harm principle: While addressing the obligation of no harm and its relationship with equitable utilization, the 1997 Convention puts significant emphasis on relevant procedural duties. Article 7 of the Convention requires a watercourse state to take all appropriate measures to prevent causing of significant harm to other watercourse States. If significant harm, however, is caused, Article 7 requires the state causing such harm to give due regard to Article 5 and 6 and to consult the affected State in order to eliminate or mitigate such harm and to discuss the question of compensation in appropriate cases.

Exchange of information: Article 9 provides for regular exchange of data and information on the condition of a watercourse. The purpose is to ensure that the watercourse states will have the facts necessary to enable them to comply with their obligation under Article 5, 6 and 7 (ILC Report, 1994; p-250).

Violation of World Bank Environmental Policy: Except in specified circumstances, the WB policy doesn't allow financing of a project on an international waterway until all the riparian are notified of the project and Have voiced no objection .But till now the people of lower riparian country like Bangladesh has the objection regarding the Tipaimukh Dam.

5. CONCLUSIONS & RECOMMENDATIONS:

The urgent need at the present situation of Tipaimukh dam is mentioned below:

1. Independent and informed impact assessment studies of Tipaimukh project using World Commission of Dams criteria and guidelines and to suggest alternatives, including de- commissioning of dams. The review should encompass both techno-economic feasibility and environmental appropriateness which is compatible with the social and cultural needs of the NE people.
2. The environmental impact assessments (EIA), environmental management assessments (EMA), social, cultural and health impact assessments of Tipaimukh dam should be independent, accountable and respect

customary practices of the indigenous and tribal peoples of the region and ensure their free, prior and informed consent and meaningful participation.

3. An approach to water resource development based on a comprehensive respect for rights, valuing of equity and sustainability, effective participatory decision making, accountability and efficiency.
4. Establishing clearly defined and legally binding norms of accountability for the projection of costs, benefits and impacts of water and energy resource projects at the national and international levels.
5. A Comprehensive process of resettling those individuals, families and communities involuntarily displaced in ways which restore or improve the conditions that they enjoyed prior to displacement and with the participation and satisfaction of an independent panel of experts that have been mutually and publicly chosen by affected communities and other concerned people.
6. Lands that are acquired for development project purposes from the affected families and communities to be never be permanently alienated from them, and should be returned to the rightful original owners when the project is terminated, decommissioned or otherwise discontinued. Environmental and other adverse impacts on the land must be restored and/ or rehabilitated by the project authorities and planners at their cost before returning such lands to the original owners.
7. A comprehensive and independent review of the implementation and experience of the present EIA Notification 1994 (amended), Ministry of Environment and Forests, and related environment clearance procedures to be carried out immediately.
8. A legally enforceable right to information regarding planning, decision making implementation, operation and decommissioning of all water and energy resource projects for all affected or potentially affected citizens in their native languages before development projects such as hydroelectric projects are cleared for implementation.
9. Institutional frameworks which are culturally, socially appropriate to the indigenous peoples of the region ensuring their meaningful participation in the planning, execution and monitoring of projects and in benefit sharing.

10. All governments, implementing agencies, regional and international financial institutions, 'donors', investors and corporate bodies to adopt policies, guidelines, programmes and projects consistent with the framework proposed by the world Commission on Dams. A high-level national Task Force should be constituted to review the final recommendations of the World Commission on Dams with the intention of examining these recommendations for adoption by the government of India and the institution of a statutory multi-stakeholder national monitoring mechanism for dams.
11. Bangladesh Government should try to get update information from India regarding the Tipaimukh dam.
12. India has to ensure the equitable sharing, no harm principle and exchange of information of 1997 UN Water Course Convention.
13. Public awareness has to build up regarding the negative impacts of Tipaimukh dam both in India and Bangladesh.
14. Civil society NGO workers have to be more active to protest against the implementation of the project.

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NOMENCLATURE:

BWDB	Bangladesh Water Development Board
NERP	Northeast Regional Water Management Project
NEEPCO	North-Eastern Electronic Power Co-operation
Km	Kilometers
UN	United Nations