State of India's Rivers

for

India Rivers Week, 2016

NORTH EAST

(Non Brahmaputra)

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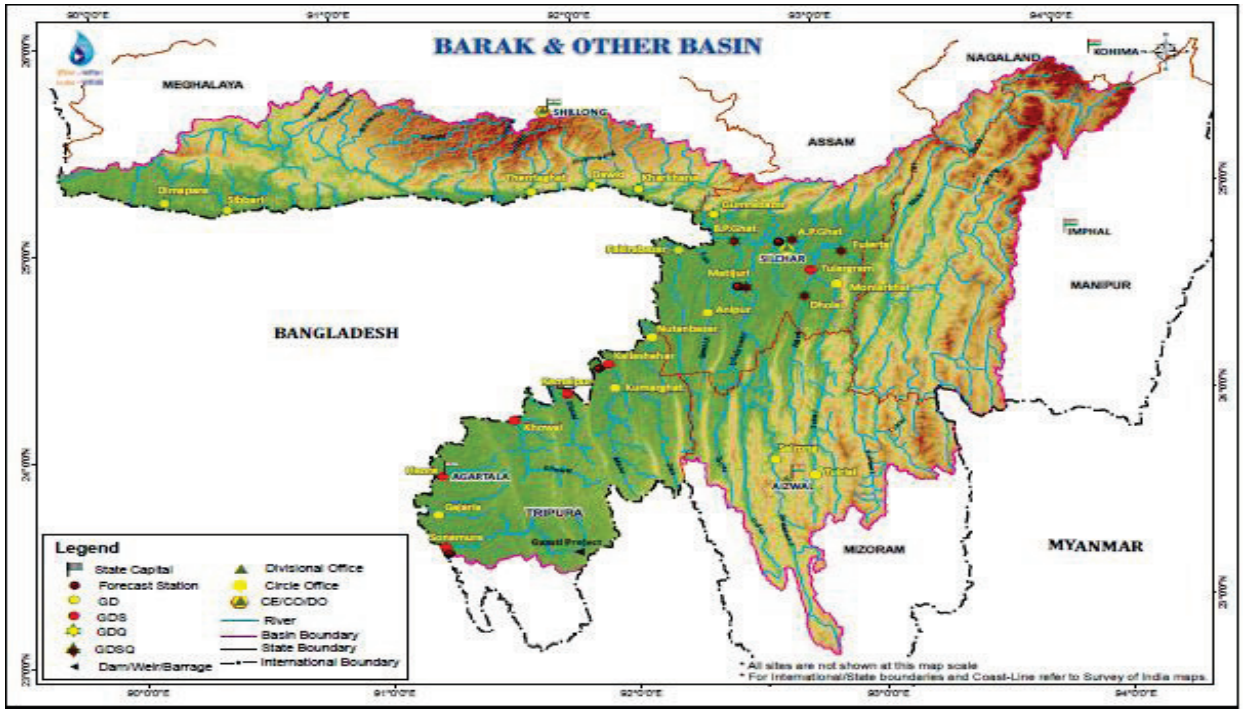
OVERVIEW OF BARAK RIVER SYSTEM AND OTHER MINOR RIVERS FLOWING TO BURMA AND BANGLADESH

The Rivers of North East India broadly falls under the Brahmaputra –Barak River Basin. Many of the Rivers flowing in North East India are trans-boundary Rivers, either flowing into Burma or Bangladesh. The Brahmaputra River, the Teesta and the Barak River are the main Rivers flowing into Bangladesh. While the Kaladan River, the Manipur River, Tizu River etc flowing in the States of Mizoram, Manipur and Nagaland are the main Rivers flowing to Burma. Most of the Trans Boundary Rivers in North East are both targeted for construction of mega dams, irrigation projects, development of waterways etc.

1. Barak River System

The Barak River basin covers parts of India, Bangladesh and Myanmar. In India it spreads over states of Meghalaya, Manipur, Mizoram, Assam, Tripura and Nagaland having an area of 41,723 Sq.km which is nearly 1.38% of the total geographical area of the country. The basin extends between 89°50’ to 94°0’ east longitudes and 22°44’ to 25°58’ north latitudes with maximum length and width of 460 km and 350 km. It is bounded by the Barail range separating it from the Brahmaputra basin on the north, by the Naga and Lushai hills on the east and by Mizo hills and territory of Bangladesh on the south and west. The Barak River originates from the Manipur hills, from Liyai Village in Senapati district in Manipur at an elevation of 2,331 m. It flows along Nagaland-Manipur border through hilly terrains and enters Assam



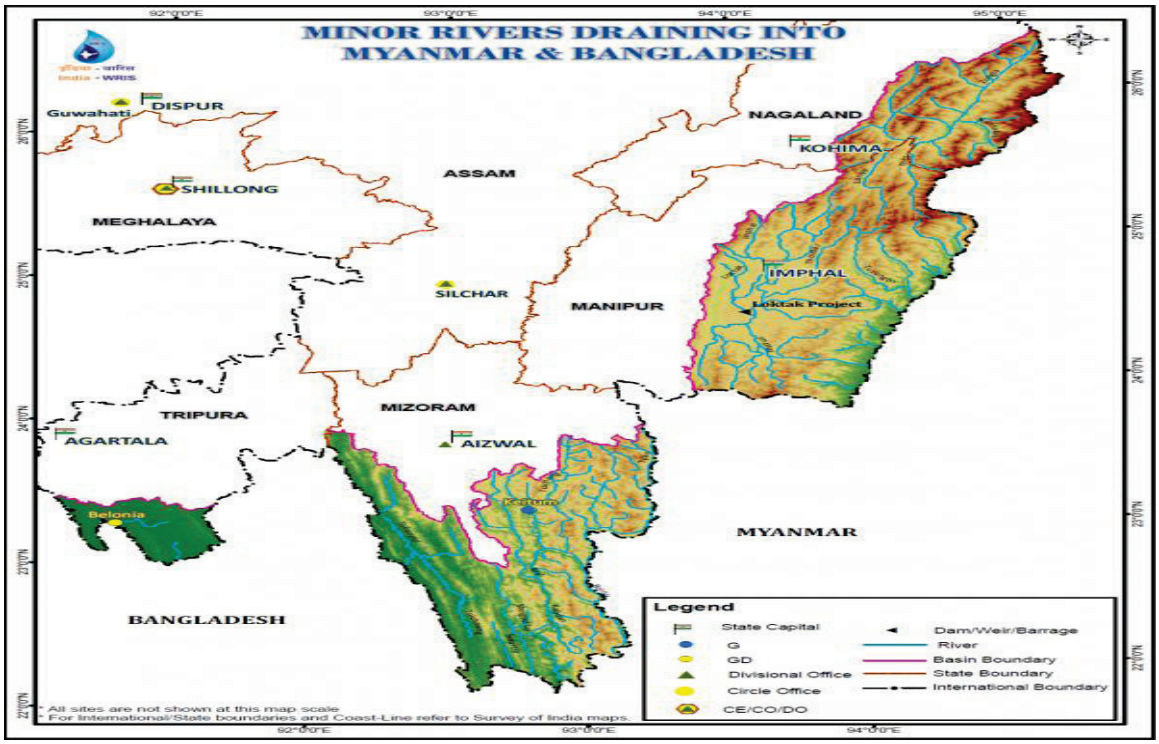
Map No 1: Barak and Other River Basin

The Barak River further enters Bangladesh where it is known by the name of the Surma and the Kushiyara and later called the Meghna before receiving the combined flow of the Ganga and the Brahmaputra. The length of the Barak River from its origin upto the border of Assam along the Kushiyara is 564 km. The principal tributaries of Barak joining from north bank are the Jiri, the Chiri, the Modhura, the Jatinga, the Harang, the Kalain and the Gumra whereas the Dhaleswari, the Singla, the Longai, the Sonai and the Katakhal joins from south bank.

The major part of basin is covered with forest accounting to 72.58% of the total area and only 1.92% of the basin is covered by water bodies. The basin spreads over Assam, Tripura, Meghalaya, Mizoram, Manipur and Nagaland. The Barak sub-basin drains areas in India, Bangladesh and Burma. The drainage area of the sub-basin lying in India is 41723 sq. km. which is nearly 1.38% of the total geographical area of the country. The sub-basin lies in the States of Meghalaya, Manipur, Mizoram, Assam, Tripura and Nagaland. The State-wise distribution of drainage area stands at 10650 sq.km in Meghalaya, 9567 in Manipur, 8866 in Mizoram, 7224 in Assam, 4688 in Tripura, 728 in Nagaland

2. Minor rivers of North East draining into Myanmar and Bangladesh

The basin of Minor Rivers draining into Myanmar and Bangladesh extends over states of Mizoram, Nagaland, Manipur and Tripura having a total area of approx. 36,202 Sq.km and its geographical extent is between 91°33' to 94°52' east longitudes and 21°45' to 26°40' north latitudes. The basin is bounded by Purvanchal range in the north and the west and by Bay of Bengal in the east and the south.



Map No 2: Minor Rivers Draining into Myanmar & Bangladesh

The Imphal River is the main river of the basin and it rises near Kangpokpi in Senapati district of Manipur and receives the Iril River from the south and the Thoubal River from the east. It also receives the Khuga River from the south-west and is known as Manipur River below its confluence. The Chakpi River joins Imphal River from the opposite direction 3 km below Shugnu and the combined water flows southward through a narrow gorge to fall into the Chindwin river of Burma. The major part of basin is covered with forest accounting to 71.64% of the total area and only 1.66% of the basin is covered by water bodies.[1]

DESCRIPTION OF RIVERS IN BARAK RIVER BASIN

3. Rivers of Manipur

Within the State of Manipur, there are two major river basins, viz. the Barak River Basin and the Manipur River Basin. The total water resources of the two basins have been estimated to be 1.8487 million hectare metre in the form of annual yield. The Barak River originates from the northern hills and is joined by a number of tributaries such as Irang, Makru, Tuivai, etc. and thereafter enters Cachar District of Assam. The Barak raises in the Manipur hills and enters the plains near Lakhipur. The river enters Bangladesh as Surma and Kushiyara. Later, the river is called the Meghna and receives the combined flow of the Ganga and Brahmaputra. The principal tributaries of Barak are the Jiri, the Dhaleswari, the Singla, the Longai, the Sonai and the Katakhal.[2]

The water resources of the Barak River basin and the Manipur River basin are estimated to have an average annual yield of 1.8487 million hectare metres (Mham), i.e., 14.98 million acre feet, with the former contributing of 1.3295 Mham[3]. The basin extends over states of Mizoram, Nagaland, Manipur and Tripura having a total area of approx. 36,202 Sq.km and its geographical extent is between 91°33’ to 94°52’ east longitudes and 21°45’ to 26°40’ north latitudes. The basin is bounded by Purvanchal range in the north and the west and by Bay of Bengal in the east and the south. The Imphal is the main river of the basin and it rises near Kangpokpi in Senapati district of Manipur and receives the Iril from the south and the Thoubal from the east. It also receives the Khuga from the south-west and is known as Manipur River below its confluence. The Chakpi River joins Imphal from the opposite direction 3 km below Shuganu and the combined water flows southward through a narrow gorge to fall

[1] Minor Rivers flowing to Myanmar and Bangladesh - India WRIS
http://www.india-wris.nrsc.gov.in/wrpinfo/index.php?title=Minor_rivers_draining_into_Myanmar_%26_Bangladesh

[2] Barak and others – India WRIS

http://www.india-wris.nrsc.gov.in/wrpinfo/index.php?title=Barak_and_others

[3] Source: IFCD, 1984, Government of Manipur

into the Chindwin river of Burma. The major part of basin is covered with forest accounting to 71.64% of the total area and only 1.66% of the basin is covered by water bodies.[4]

3.1 Barak River

The Barak River is one of the major rivers of Manipur, further flowing to South Assam and is a part of the Surma-Meghna River System. After Manipur it flows through Mizoram State and into Assam, ending just after it enters Bangladesh where the Surma and Kushiyara rivers begin. From its source in the Manipur Hills of India, Liyai Village (Zhaimai) of Poumai Naga tribe, the river is known as the Barak River (Locally known as Avourei). It flow west through Manipur State, then southwest leaving Manipur and entering Mizoram State.

The Barak basin is the second largest basin in North-East India and constitutes the part of Ganga-Brahmaputra river system. It originates from Liyai Khullen, border of Nagaland and Manipur, traverses through the denuded tertiary ranges in Manipur and further drains to lower Assam Plains with its large flood plains and finally joins the Bay of Bengal as Meghana in Bangladesh. The Barak River system is a part of the Ganga –Brahmaputra - Meghna system. The length of the river Barak from the source to the Indo-Bangladesh border along Kushiyara is 564 km and out of this length within the state of Assam is 143 km. The Barak River and its branches Kushiyara and Surma are fed by a number of tributaries.

Figure 1: The Barak River at Bamgaijang Village, Tamenglong, Manipur

[4] http://www.india-wris.nrsc.gov.in/wrpinfo/index.php?title=Minor_rivers_draining_into_Myanmar_%26_Bangladesh

Figure 2: Barak River in Lakhipur, Assam

The Upper Barak basin constitutes a large geographical area in western Manipur, Nagaland and Mizoram. Series of mega dams are planned over the Barak River and its Tributaries, which includes the Irang River, Tuivai River, Irang River etc. The proposed 1,500 MW Tipaimukh Multipurpose Hydroelectric Project is planned over the Barak River, by the National Hydroelectric Power Corporation and the Satluj Jal Vidyut Nigam Limited, along with the Government of Manipur at the tri-junction of Manipur, Mizoram and Assam[5]. The proposed Tipaimukh dam project is planned to be constructed 500 metres downstream of the confluence of the Barak River with River Tuivai in Manipur. The project envisages construction of 162.80 m high rock-filled dam with annual estimated generation of 3805.74 MU in 90% dependable year with an installed capacity of 1500 MW (6x 250 MW).

3.2 Manipur River

The Manipur river originates from north of Karong, in the Senapati district, traversing through a stretch of 50 km in the hilly tract, meanders through the Manipur valley in a North West-South East direction. The Manipur river basin has eight major rivers such as Imphal, Iril, Nambul, Sekmai, Chakpi, Thoubal and Khuga. All these rivers originate from the surrounding hills. Almost all the rivers in the valley area are in the mature stage and, therefore, deposit the silt load in the Loktak Lake.

[5] "WATERSHED PRIORITIZATION OF BARAK BASIN USING GEOGRAPHIC INFORMATION SYSTEM AND REMOTE SENSING", Arun Kumar, Department of Earth Sciences, Manipur University, Canchipur, Imphal -795 003, Manipur
http://www.moef.nic.in/downloads/public-information/Water-Resource-Summaries.pdf

The Manipur River arises in the north at Karong. It flows southwards of Imphal and is also known as Imphal River. Manipur river basin encompasses an area of approximately 7,000 sq. km in the state. The half of the Manipur valley area is covered by the Loktak and other small lakes. The major tributaries are Iril, Thoubal, Chakpi, Khuga, rivers, which join Manipur River at different places. It traverses through hills and valleys and displays various geo-environmental regimes[6]. The total water discharge from the Manipur River Basin draining the eastern half of the state including the Manipur Valley has been estimated to be 1.8545 million hectare metres. Manipur River Basin accounts for 0.5192 hectare metre of annual run-off against a total drainage basin area of 6,865 sq. km in the eastern part of Manipur.

The Manipur River is drained by various streams and rivers, which belong to three river systems namely, (a) the Barak system (b) the Manipur system (c) the Chindwin system.

a) **The Barak river and its tributaries** — Irang, Makru, Tuivai and Jiri — flow through the northern and western hills of the state, and have a total catchment area of 9,042 sq.km. This forms approximately 40.5 per cent of the region.
b) **The water resources of the central valley** include the Manipur River and its tributaries namely, Imphal, Iril, Thoubal, Nambul, Nambol, Khuga, Sekmai, and Chakpikarong, along with Loktak and its associated lakes. These have a total catchment area of 6332 sq. km and cover 28 per cent of the state's total area.
c) **The Chindwin system** consists of a number of small streams draining the eastern slopes of Manipur's eastern hills, and has a total catchment area of 6,953 sq. km. This forms approximately 31.1 per cent of the state's total area. The streams in this system are Akonglok and its tributaries, Chamu and Chingai, and Yu and its tributaries, Maklong, Tuyangai, Taret Lok, Lokchao, Lilimlok and Tuiyang.

The Manipur river has been regulated by two barrages for irrigation and hydropower. The Imphal Barrage downstream of Lilong regulates the flow for irrigation purposes while the second barrage at Ithai, diverts the river flow into the Loktak Lake for lift irrigation and hydropower project The Ithai Barrage of the 105 MW Loktak Multipurpose Hydroelectric Project blocks the Manipur River to convert the Loktak wetlands as a reservoir for the project for power generation at Leimatak after diverting the water through the Ningthoukhong canal.

4. Rivers of Meghalaya

Meghalaya, a state in north-east India, covers an area of approximately 22,430 square kilometers. The Meghalaya subtropical forests eco-region encompasses the state; its mountain forests are distinct from the lowland tropical

[6] "GEO-ENVIRONMENTAL STUDIES OF MANIPUR RIVER BASIN, Arun Kumar, Department of Earth Sciences", Manipur University, Canchipur, Imphal -795 003, Manipur
http://www.moef.nic.in/downloads/public-information/Water-Resource-Summaries.pdf

forests to the north and south. In the Garo hills, the important rivers of the northern system from west to east are the Kalu, Ringgi, Chagua, Ajagar, Didram, Krishnai and Dudnai. The important rivers of the southern system are Daring, Sanda, Bandra, Bhogai, Dareng and Simsang. Simsang is the largest river in the Garo hills. In the central and eastern section of the plateau the important northward flowing rivers are Umkhri, Digaru and Umiam and the south-flowing rivers are Kynchiang, Mawpa, Umiew, Myngot and Myntdu. The Myntdu River, Piyain River, Someshwari River are trans-boundary rivers and flows into Bangladesh. Some basic details of Trans boundary Rivers of Meghalaya are outlined below:

4.1 Myntdu River

The Myntdu River of Meghalaya is among the chief rivers in the District Jaintia Hills. The local name of this river is 'ka Tawiar ka Takan' meaning ‘Our Guardian Angel’. It is a blessing to the residents of the town of Jowai and adjacent places. Its abundant water is used to irrigate the Myntdu Valley, located on the outskirts of Jowai town.

The Myntdu River originates at Mihmyntdu, a place very close to Jowai town. This point where it originates is at 1420 meters above the sea level. This river flows through Jowai encircling it on three directions excepting the northern part of the town, thus leaving it open. In its course while flowing forward it experiences a plenty of sharp drops. After being originated from the eastern region it heads towards the south and extends up to a distance of around 10 kilometers. On that point the river turns sharply eastward and keeps on advancing for about an extent of 11 kms before encountering a gradual drop by about 595 meters. In its due course it gradually streams towards Leshka at an elevation of about 595 meters where it meets its two tributaries, Umshariang and Lamu. The Myntdu River after flowing southwards from Leshka joins its major tributary of the Lynriang River at a height of 335 meters. With a loop up to a height of 30.5 meters the river proceeds towards Kharkhana where it drops by about 564 meters. The River then gradually advances towards Bangladesh in its course and acquires the name ‘Hari’ as soon as it enters there.

The chief tributaries of the Myntdu River are Umshariang, Lamu and Lynriang River. The two tributaries of the river, namely Umshariang coming from the west and Lamu coming from the east unite with the Myntdu River and form a tri-junction of three tributaries named as Leshka. The Myntdu River after flowing southwards from Leshka joins its major tributary of the Lynriang River at a height of 335 meters. This river flows with a steep gradient and extends up to an elevated range of around 1220 meters.

The Myntdu River is often described as the guardian and protector of the inhabitants of Jowai region. It is considered as a blessing for the people of the towns and villages that are nourished by its water. The river is thus respected and worshipped as a protector. Ceremonial sacrifices are also arranged in order to appease the river. The River Myntdu features a highly fragile geology and comes with steep slopes. As such it experiences heavy sediment load in the catchment area.

The Lamu River is one of chief tributary of the Myntdu River. This tributary meets River Myntdu from the west side and unites with it to form the tri-junction of tributaries at Leshka. The Lynriang River is a major tributary of the Myntdu River. After flowing from Leshka the Myntdu River joins its major tributary of the Lynriang River at a height of 335 meters.

The Umshariang River is another chief tributary of the Myntdu River in Meghalaya. This Tributary comes from the west and joins the River Myntdu to form a tri-junction known as Leshka. It is a highly fast flowing river. It flows below the natural root bridges in Cherrapunjee. The water of this fast flowing river is used in the hydroelectricity projects on Myntdu River.Using the Umshariang tributary the Myntdu –Leshka dam is constructed across the Myntdu River. The Myntdu-Leshka Dam is constructed transversely over the river. The Myntdu-Leshka Hydro Project Dam (3X42 MW)[2] built across the river, undertaken by Meghalaya Electricity Corporation Limited , is located at Leshka, West Jaintia Hills District, Meghalaya near Amlarem, the sub-division headquarters.

4.2 Someshwari River:

Someshwari River, known as Simsang River in Meghalaya, is a major river in the Garo Hills of Meghalaya and Netrakona District of Bangladesh. It divides the Garo Hills into two parts. Someshwari River is considered as the largest and the second longest river in Meghalaya. The Someshwari originates from the Nokrek Peak of the Nokrek Mountains. Starting from the Nokrek Peak the Someshwari advances eastward, streaming across Rongrenggre and Williamnagar, the headquarters of East Garo Hills district. From there it surges through Nongalbibra, Siju, and Rewak and ultimately reaches Baghmara, the headquarters of South Garo Hills district. Someshwari River is also a major river of the Netrokona district of Bangladesh. It approaches to Bangladesh by passing through Susang-Durgapur and other regions of the Netrokona district. While transcending the borders of Bangladesh and gushing into it, the River Simsang changes its name into Someshwari

The Chibok River is one of the chief tributaries of the Someshwari River in Meghalaya. The Chibok River unites with River Someshwari in its gradual course. The Chibok River joins with the Someshwari before its entering into Bangladesh and results in its swelling and attainment of speed. A 70 meter footbridge is constructed on the Chibok River in order to join the Nengmandalgre and Bolkinggre villages. The Rongdik River is another chief tributary of the Someshwari River. The Rongdik River is a river originating from Meghalaya and meets with the river Someshwari as one of its tributaries. It allows the Someshwari to swell before it crosses the Indian Borders and falls into Bangladesh.

The Rompa River is also a major tributary of the Someshwari River. After passing through several towns of Meghalaya the Someshwari River confronts its tributary, the Rompa River and unites with it. The tributaries of the Rompa River flow in a north-west to south direction. The last tributary of the Someshwari River is The Ringdi

River. It is one of the four tributaries that join the Someshwari in its course before falling into Bangladesh. The River lends a fullness and speed to River Someshwari.

4.3 Kynshi / Jadukota River

Kynshi River, also known as Jadukata, is one of the important rivers in Meghalaya. The main tributaries of Kynshi are Umrilang (60 km long) and Um-mawblei (71 km long). Kynshi River is known as Kynshiang at the confluence with Umkyrtha. Nongkhnum Island, the biggest river island in Meghalaya, has been formed by the bifurcation of the Kynshi River into two rivers namely - Phanliang River and Namliang River. At the point of bifurcation, there is a charming sandy beach called Wei-Phanliang, about 100 sq m in area. Kynshi flows towards the southern part of the West Khasi Hills of Meghalaya. Finally, this river flow further south into Bangladesh. This 143 km long River irrigates over 2000 sq km of area of agriculture land in Bangladesh primarily.

4.4 Umngot River

Umngot River is a major south -flowing river originating from the eastern part of the Shillong Peak near a village called Smit in East Khasi Hills of Meghalaya. Starting from an altitude of about 1,800 m above sea level, it forms the boundary between East Khasi Hills District and Jaintia Hills District and emerges through a gorge at Shnongpden. This 82 km long river irrigates (including its tributaries) over 800 sq km and is famous for angling. Umngot River continues in its less turbulent form to flow by the fine gorge near Dawki and finally enters into the plains of Bangladesh.

4.5 Piyain River:

Piyain River is a trans-boundary river in Meghalaya.[1] It is a tributary of the Surma River, which originates from the Umgat river of Assam.[2] The river enters Bangladesh through Sylhet district. The length of the river is 145 km.[2] Piyain River has emerged from the river Om or Umagat River or Assam

5. Rivers of Nagaland

Nagaland is dissected by a number of seasonal and perennial rivers and rivulets. The major rivers of Nagaland are Doyang, Dikhu, Dhansiri, Tizu, Tsurong, Nanung, Tsurang or Disai, Tsumok, Menung, Dzu, Langlong, Zunki, Likimro, Lanye, Dzuza and Manglu. All these rivers are dendritic in nature. Of the rivers, Dhansiri, Doyang and Dikhu flow westward into the Brahmaputra River that falls into Bangladesh. The Tizu River, on the other hand, flows towards eastern part of Nagaland and joins the Chindwin River in Burma.

5.1 Tizu River

The River Tizu originated in the hills of Nagaland and flows across major section of the state and finally enters Myanmar near International Boundary Pillar (IBP) No. 133 at Avankhu Village and falls into Chinwin River of

Myanmar. The Tizu River forms an important drainage system in the eastern part of the state with a total lenght of 203km (from Helipong rear to Avankhu area). It originates from the central part of the state and runs through northeast direction flowing through Zunheboto, Phek district and empties itself in the Chindwin River of Myanmar. The main tributaries of river Tizu are river Zunki, Lanye and Likimro.

Figure 3: Tizu River in Nagaland

The Tizu river of Nagaland flows into Myanmar, draining an area of about 5500 sq. km in Nagaland. It originates near Longkhim (2253m) Tuensang district, and flows for about 115 km and joins Lanyie – Thetsiru River. It flows for another 35 km north-Easterly up to Longmatra Tizu River and joins Chindwin River near Myingan Town in Myanmar. The river Tizu after crossing Nagaland border in India enters into Myanmar, where it joins the Chindwin – Airwady river system. The river serves as international waterway since the waterway link in Myanmar has lot of IWT potential. The catchment area of river Tizu is of about 9625 sq. km and falls within Kiphire, Phek and Zunheboto districts of Nagaland and Ukhrul district of Manipur. It is the second largest and longest rivers of Nagaland roughly covers one – third area of the state and is located within the innermost high mountain range bordering Myanmar.

Tizu River forms an important drainage system in the eastern part of Nagaland. It runs through a northeast direction flows through Zunheboto, Phek district and empties itself in the Chindwin River of Myanmar. The Zunki River which is the biggest tributary of Tizu, starts from the northeastern part of Changdong forest in the south of Teku and flows in southernly direction towards Noklak, Shamator and Kiphire and finally joins Tizu below Kiphire.

The Zunki River, which is the biggest tributary of Tizu, starts from the northeastern part of Changdong forest in the south of Teku and flows in southerly direction towards Noklak, Shamator and Kiphire and finally joins Tizu below Kiphire. Its total length measures about 80km (from Chingmei/Noklak area to Tizu confluence area).

A team of Thottapalli Power Private Limited (TPPL) is conducting survey for the proposed construction of 36 MW hydroelectric project at Tizu River under Pungro sub-division in Kiphire district. Official sources today said once survey is completed, the project would be the second largest in Nagaland, next to Doyang Hydro Electric Project (75MW). The survey team is headed by project manager Hanumania Rao. Tizu River is another tributary of Likimro River in Kiphire district, on which the Likimro Hydro Electric Project was built and producing 24 MW electricity[7].

Following the state government's decision to develop River Tizu under centrally sponsored scheme (CSS), a team of officials from Inland Waterways Authority of India (IWAI), Ministry of Shipping and from the state planning department recently visited the river and inspected the river from as many points as possible and examined the viability of undertaking a hydrographic survey all across the length of the river, which would form the basis for preparation of a DPR for further development of the river under CSS. The team observed that the river had very good potential for its development for Inland Water Transport (IWT) operation and in the future could provide India and Nagaland connectivity with Hthimathi Port of Myanmar, through the Chindwin River. The development of IWT in Tizu River is part of "Look East Policy" of the government of India. IWAI team members proposed to carry out hydrographic survey in the second week of February 2015. It is projected that border trade in Nagaland will be a boost once the two river routes are declared as national waterways[8].

[7] Posted at: Oct 27 2015 2:58PM
Survey on hydro project at Tizu River in Nagaland, http://www.uniindia.com/survey-on-hydro-project-at-tizu-river-in-nagaland/others/news/250234.html#Z2uTR2KdrXCHC5Kk.99

[8] "Tizu, Zungki river routes identified for national tag",

DIMAPUR, NOV 21(NPN), Published on 22 Nov. 2015

5.2 Doyang River

Figure 4: Doyang Dam over Doyang River

The Doyang River, which is one of the key Rivers of Nagaland, originates from the Japfü Hill near the Southern slope of Mao in Manipur and moves in a south west direction passing through Kohima district and flows northward into Zunheboto and Wokha District. It passes through a great part of Wokha District and flows south westerly into Dhansiri in Sibsagar, District of Assam. The length of the river is 167 (From Gariphema/Ghathashi area to Liphi). The main tributaries of Doyang are Chubi River which flows southward from Mokokchung District and Nzhu River, originating from Nerhema area of Kohima district and flows through Miphong in Tseminyu area and finally pours itself to Doyang. The Doyang River is subjected to construction of the Doyang Hydroelectric Project, one of the most controversial in Nagaland for its wide social and environmental impacts.

5.3 Dikhu River

Figure 5: Dikhu River

The River Dikhu with a total length of about 171 km (from Phuye/Surumi area to Naginimora) originates from Nuroto Hill area in Zunheboto district of Nagaland. The river traverses towards north along the border of Mokokchung and Tuensang districts. The main tributaries of river Dikhu are Yangyu of Tuensang district and Nanung in the Langpangkong range in Mokokchung district. The river flows further northward and leaves the hill near Naginimora and finally merges with the Brahmaputra River in the plains of Assam.

5.4 Dhansiri River

Figure 6: Dhansiri River

Dhansiri flows through the southwestern part of the state through Rangapahar-Dimapur Plains of Dimapur District, with a total lenght of 241km (from New Ngaolong area to Nuiland area). This river receives almost all the western and southern drainages of Nagaland. Its main tributaries are river Dzuza and Diphu. At the extreme southwest of the state, it assumes a northwardly course forming a natural boundary with North Cachar Hills of Assam which finally drains into the Brahmaputra.

The river Dhansiri is a major south bank tributary of river Brahmaputra. It originates in the Naga Hills north of Kohima in Nagaland at an altitude of about 800 m above MSL. It runs through the hilly areas, rapids and rough terrain in Nagaland and enters in to alluvial plains of the Dhansiri sub division in Assam (Fig. 4.7). It confluences with the river Brahmaputra at Dhansirimukh, about 15 km downstream of Numaligarh road bridge. The river traverses a total length of about 255 km from its origin to confluence and meanders at many places on its way. The river flow is augmented by inflowing tributaries namely Dayang, Diphupani, Khora, Langlong, Beopani etc[9].

9 http://mdoner.gov.in/sites/default/files/silo4_content/REPORT%20STUDIES%20ON%20THE%20NO

Figure 7: River in Nagaland

Table 1: List of Main River of Nagaland

Big Rivers of Nagaland

Sl.No	Name of the river	Length (Km)	Catchment Area (Km^2)	Length Measurement Points
1	Zungki	80	2060	From Chingmei / Noklak area to Tizu confluence area
2	Tizu	203	2760	From Helipong area to Avankhu area
3	Milak	67	845	from Aliba / Mopungchuket area to Tzidikong area
4	Doyang	167	3283	From Gariphema / Ghathashi area to Liphi
5	Dikhu	171	2996	From Phuye / Surumi area to Naginimora
6	Dhansiri	241	2262	From New Ngaolong area to Nuiland Area
7	Barak	53	809	From Puilwa area to Manipur Boundary

Note: length of river and catchment area calculated in GIS environment.

Source: Nagaland GIS and Remote Sensing Centre, Planning and Coordination Department, Government of Nagaland.

RTH%20EASTERN%20REGION/report%20studies/Identification%20of%20Potential%20Waterways%20in%20NER.pdf

6. Rivers of Tripura

The Khowati, the Manu, the Haorah, the Muhuri and the Gomati are some important rivers of Tripura. Gomati is the largest and considered to be the most sacred of all the rivers in Tripura. The source of the river is taken to be Tirthamukh where lies the beautiful Dumbar falls - one of the most important holy places. The rivers Khowai, Doloi, Manu, Juri and Langai are flowing towards the north and those flowing towards west are the Gomati, Muhuri and Feni.

A study of basin characteristics by CSME (1989) indicate that eight of the ten basins are within the territorial limit of Tripura while basin areas of river Fenni and Langai are shared by two Indian States viz. Tripura and Mizoram and Bangladesh. Collectively basin area of ten major rivers and other minor streams covers nearly 10,500 sq. km (Table-20). In terms of percentage of the basin of individual rivers vis-a-vis, total basin Gumti (22.66%), is followed by Manu-Deo (18.36%) and Khowai (13.13%).

6.1 Gumti River

The Gumti River is a river of north-east India (Tripura state) and Bangladesh. The catchment area of Gumti River with in the Indian Union is 2492 Sq km and it is the largest sub basin among the rivers in Tripura. It is surrounded by Bangladesh on its east and west. It originates from the hill ranges connecting Atharamura & Longtharai on the north-east boundary of South Tripura district and flows down through Sonamura sub division across the Bangladesh border to out fall into the river Meghna. The total length of the river is about 167 km.

The Gumti basin is situated in the lower middle part of Tripura. Gumti is the major river of Tripura. The basin lies in the districts of South Tripura, West Tripura and some part of Dhalai Tripura spreading from eastern to western boundary of the state. It is located between latitudes 23º19′ and 23º47′ N and longitudes 91º14′ E and 91º58′ E. The Gumti basin is surrounded by Bangladesh on its east and west.

Gumti rises from the range connecting Longtharai and Atharamura. It is a big river and runs across Amarpur, Udaipur and Sonamura subdivisions and then flows towards Bangladesh by the side of Sonamura town. The length of the river in Indian part is 167.4 km. It is located between latitudes 23º19′ and 23º47′ N and longitudes 91º14′ E and 91º58′ E.

At the source Raimacherra flows from the confluence of Kalyansingh and Malyansingh near Kanti Charan Para in the eastern part of Amarpur subdivision till it meets the Surmanadi near Duchaibari at the altitude of 86.87 m. After this point the river assumed the name of Gumti and flows down through deep gorges up to Dumbur falls. The Gumti takes a westerly turn at this point and flows down for about 10 km, where it turns northward up to Amarpur and again flows westwards and enters into the plains near Maharani. After entering into the plains the river generally flows in west and south - west direction and it enters into the Bangladesh territory at Sonamura.

The river then flows through plains of Bangladesh and meets the Meghna river system near Daudkandi. The length in this reach is about 77 km in Bangladesh. Its tributaries are Kanchi Gang, Pitra Gang, San Gang, Mailak Chhara and Surma Chhara (right bank tributary) and Ek Chhari, Maharani Chhara, Ganga (left bank tributary). The Gumti sub - basin receives an average annual rainfall of 2238.40 mm. A dam has been constructed near Dumbur on the river that has formed a lake covering 40 square kilometers (15 sq mi).[10]

6.2 Manu River:

The Manu River rises in the mountains of Tripura. After its initial rapid passage through mountainous terrain it slows and meanders during its course, which includes the Sylhet plains. It joins the Kushiyara River at Manumukh in the Bangladeshi district of Moulvibazar.

6.3 Feni River

The Feni River is a river in Tripura and southeastern Bangladesh. The Feni River originates in South Tripura district and flows through Sabroom town and then enters Bangladesh. Muhuri River, also called Little Feni, from Noakhali District joins it near its mouth.

The Feni River is a trans-boundary river with an ongoing dispute about water rights. According to statement on sharing of river waters with Bangladesh, released by India in 2007, "Feni River has been added to its mandate in the 36th JRC meeting. A decision was taken in the meeting that the Ministers of Water Resources of both the countries would visit the sites where developmental works have been held up. This Joint Inspection of various locations of developmental and flood protection works on common rivers was held from September 14–21, 2006[11].

7. Rivers of Mizoram

Most of the rivers of Mizoram originate in the Central part and flow either towards south or north, creating deep gorges between the hill ranges. The main northerly flowing rivers of Mizoram are, Tlawng, Tut, Tian, Tuichawng, Tuirial, Tuivawl, Teirei, Tuirini and Serlui. The largest of these is the Tlawng (Dhaleshwari) with a length of 185.15 kms. Tlwang, Tuirial and Tuivawl Rivers drain into the Barak River directly. All other rivers meet the Barak River through indirect and subsidiary channels either via Tripura-Bangladesh or via Manipur. Ultimately, the northerly flowing rivers of Mizoram, drain into the Barak River and constitute a part of “Barak Basin”. Barak River, in due course drains into “Brahmaputra” as its left bank tributary. The southerly flowing rivers of Mizoram constitute part of “Kolodoyne Basin”. The southerly flowing rivers ultimately drain in the Bay of Bengal, either through Myanmar or through Bangladesh.

[10] THE MASTER PLAN OF GUMTI SUB - BASIN, 1996
[11] https://en.wikipedia.org/wiki/Feni_River

7.1 Kaladan River:

The biggest southerly flowing river in Mizoram is the River Kolodoyne (also known as Chhimtuipui Lui in local Mizo language). The Kaladan River (Burmese: also Beino, Bieno Bawinu, Tuipui, and Kolodyne) is a river in eastern Mizoram State of India, and in Chin State and Rakhine State of western Myanmar. It forms the international border between India and Burma between 22° 47′ 10" N (where its tributary, the Tio River, joins it) and 22° 11′ 06" N.

The river arises in central Chin State as the Timit, 22° 49′ 28″ N 93° 31′ 57" E, and flows south and is soon joined by the Chal, after which it is known as the Boinu River. It continues south until just before it is joined by the Twe River at 22° 08′ 40″ N 93° 34′ 30″ E, when it swings west. It continues west until 22° 05′ 20″ N 93° 14′ 12″ E, when it heads northwest. At 22° 11′ 06″ N 93° 09′ 29″ E, below Mount Phabipa, it turns north and becomes the international border between India and Myanmar. It flows north to 22° 47′ 09″ N 93° 05′ 47″ E, where the international border continues north along the Tyao River and the Boinu heads northwest into Mizoram State, at which point it is known as the Kaladan.[12]

The Kaladan River, after its origin in Chin State in Burma is joined by Tio, Mat, Tuichiang and Tuipui in Mizoram. Further, it goes back to Burma's Rakhine state, finally it enters Bay of Bengal at Akyab, a very popular port in Sittwe, Burma. The River reaches the northern most point of Mizoram, and then turns south west and is joined by the Tuichong River on the right. The river then turns south and is joined from the right by the Mat River and continues south where it joins Kawthingdeng river before it finally enter into Myanmar again.

Figure 8: Kaladan River in Mizoram

[12] https://en.wikipedia.org/wiki/Kaladan_River

At present, the Kaladan is the fifth largest river in the world to remain completely unfragmented by dams anywhere in its catchment.

7.2 Karnafuli / Khawthlangtuipui River

Karnaphuli is known as Khawthlangtuipui in Mizoram. The river Karafuli originates in the Lushai hills in Mizoram State of India and enters Bangladesh at Demagiri. The Karnafuli River flows through Rangamati and the port city of Chittagong and discharges into the Bay of Bengal near Patenga. Karnafuli River is the largest and most important river in Chittagong in Bangladesh. It travels through 180 km of mountainous wilderness making a narrow loop at Rangamati and then follows a zigzag course before it forms two other prominent loops, the Dhuliachhari and the Kaptai. A number of streams flow upstream of Rangamati. The streams are: one originating near Thekamukh in Mizoram-Bangladesh border flowing through Harina, Barkal and Sublong; one originating at Marishwa through Myanmukh and Langadu till reaching Subhalong; one flowing through Dangumura to Myanmukh; and one flow through Mahalchhari to Rangamati. The streams meet near Rangamati and their combined flow is known as Karnafuli. The river is flashy and its length is about 131 km. Rainkhiang, Sublong, Thega, Kasalong, Ichamati and Halda are its main tributaries. Its major distributaries are Saylok and Boalkhali.

ECOLOGY NORTH EAST INDIA: THREATS AND CHALLENGES

The North East region of India host two bio diversity hotspots, the Indo-Burma Biodiversity Hotspot and Eastern Himalayas Biodiversity Hotspot, which led to high diversity of flora and fauna in the region. The diversity is such that of the 1,300 species of orchids documented worldwide, 700 are found in northeastern India, with 550 species of orchids in Arunachal Pradesh alone. And of the 1,000 species of ferns found in India, over 50 percent are located in the Northeast India. In Manipur, 430 species of plants are used for medicinal purposes.

The Barak River system is unique in its diversity of both aquatic and riparian species. The Manipur River system and the Barak River system are rich in fish and other aquatic species. Some important fish species that are found in Manipur River Basins, includes the Ngara (Golden Mhaseer/tore Putitora), KHABAK (Bangana dero), Ngarinleina (Macrognatus alboguttatus), eel, Ngawa (Pontius species), Kharaobi/katla (Catla catla), Ngaton (Labio bata), Nunghanbi (Tilapia), Shaireng khoibi /Masengla (Botia berdmorei), Ngasep (Mystus bleekeri), Khaiva (Chana species), Ngamu (Channa orientalis), Ngapang (Glyptothorax), Ngaroinga/ngaroi (Crossocheilus burmanicus) and different species of grabs and primps are found too.

The catchment areas of Barak River basin have rich, luxuriant and varied vegetation. Zousiang (uningthou) , ndung (Sahikuhi), mphou (oak), nthaeng (tairen),chongrei (talhao), makou, junh, gaeng (uwah), gaengthing (semi Uwah), n-ngaih, agau and Aguretc are found.

It has been observed and documented that fishes migrated from the Chindwin-Irrawady river system of Burma to

the course of Imphal/Manipur River for breeding in the adjoining lakes and streams of Manipur valley.

The increase in the water level of Loktak due to Ithai Dam has cause a great damage to the production of aquatic plants of food and commercial importance. As for instance, the production of about 23 indigenous varieties of aquatic edible plants, e.g, Heikak, Thanngjing, Tharo, Thamball, Loklei and Pulei had been significantly reduced due to the failure in the germination and extension of their feeet to the bottom soil of the lake. On the other hand, the water level in the southern part of Manipur beyond Ithai Dam has been greatly reduced due to the blockade of water flow by the dam, caused the failure in the growth of other indigenous varieties of aquatic plants, including "Nungsam", which normally grew on the pebbles under the water current.

The maintenance of the constant water level of Loktak Lake due to the Ithai Dam has a serious effect on the ecology and existence of the seriously endangered unique Brow Antlered Deer of the floating Wild Life National Park of Keibul Lamjao. The seasonal floating and sinking of the Phumdi (floating masses of vegetation and grass) in the National Park which play an important role in the nutritional cycle of the vegetation in the National Park which play an important role in the nutritional cycle of the vegetation in the National park has not been possible due to the constant water level of the Lake.

Resident water birds like Pheasant-tailed jacana, bronze winged jacana and little grebe lay their eggs directly on the floating aquatic vegetation. Therefore, loss of aquatic plants is a serious threat to the existence of these near extinct birds of the lake. Birds like - Spotbill duck, Cotton teal, Pheasant-tailed jacana and Bronze winged jacana never reach triple figure in their population (Waterfowl counts of Loktak Lake, 2000-01)

The catchment areas of Barak River are also rich in flora and fauna. Among mammals, Mole, hedgehogs, flying lemur, bats, monkeys, black monkey, wild pigs, wild boars, pangolin etc. are some of the mammalian fauna found along Barak River basin. Jackal, sloth-bear or common black bear, tiger etc. are carnivorous animals found in this land. Mongooses, wild cats, martens weasel, elephant, dear, roe, stag are found. The sambar, dear, hog dear, bear, fox, hyena, wild pig, wild dogs, slow Loris, serow are reported. Leopard and tiger are also reported from Barak valley area and Tousem area. Amur Falcon (local name is Akhuaipuina), the migratory bird visits Tamenglong during the early winter till the last week of November. The great pied Hornbill, Hiu big and swan Hornbill (Hornbill) and Indian pied Hornbill species are found along Barak River Basin.

The Catchment area of Doyang River is a habitat of the migratory Amur Falcon birds. The catchment area, particularly the Doyang Dam Reservoir area easily qualifies for the A4 (IV) criteria (Congregations) of the Global IBA Criteria. A4 (IV) is applicable to sites known or thought to exceed the thresholds set for migratory species at bottleneck sites. The site qualifies under this criterion as it is the bottleneck site for feeding and resting of more than a million Amur Falcon Falco amurensis during their migration. IBA Criteria : A4(iv) migratory species at bottleneck sites Rokohebi Kuotsu visited the area in October 2012 and brought to light the issue of the massacre

of Amur Falcons. There is estimation that during the peak migration 12,000 – 14,000 falcons were being hunted in the area for consumption and commercial sale every day (Peter & Holman 2001).[13]

The construction of mega dams all over the Barak River Basin will destroy the habitat of these wild life, flora and faunal species. The total loss of trees and bamboo groves in both Mizoram and Manipur by the Tipaimukh Dam project is estimated at over 8 million trees and over 4 million bamboo groves. These hydroelectric projects, by submerging forest areas, will have a direct impact on the biodiversity and riverine ecology.

COMMUNITY RELATIONSHIP WITH RIVERS

Indigenous communities of North East India have intrinsic relationship with their land, forest and Rivers. Rivers of North East has been a crucial source of indigenous peoples' livelihood and survival, both physical and spiritual. For instance, the Thoubal River, one of the key tributary of Manipur River Basin, which the indigenous Tangkhul Naga communities called as Yangwuikong is sacred to many indigenous communities.

According to the Headmen and the Village Authorities, there had been a close relationship between the community people and the said river since long time ago. Their affinities are seen in terms of livelihood and food dependencies, socio-cultural and high emotional attachment. Moreover, this river supplies water for irrigation. Many households depend for their livelihood on Yangwui Kong/Thoubal River and its resources for fishing, collection of sand and pebbles. Thoubal River also serves for swimming, recreations like picnic. It also serves for the religious purposes such as Baptism and water ordeal in the final settlement of crisis in the village. Every "Iren" (water beds) has particular names and owners. Usually, there is a yearly fishing day for all the villagers irrespective of male/female or young or old, which is popularly known as "Pat-taba (Chadong, Ramrei, Thoyee)". The traditional ownership of water beds still pertains till today and in fact, they have high emotional attachment with them. The river is indeed a part of the culture of the villagers. A very different culture and concept of considering land, forest, rivers and natural resources and mere source of economic benefits and for national growth etc as against the traditional concept of land and rivers as life giver, as something that nurtures the survival and life and future of peoples and their coming generations, in the Mapithel region.

Apart from fishing, the villagers also collected snails and several other aquatic food species from Thoubal River. There has been a close relationship between man, water-bed and the god/goddess of each water-bed areas. Every water-bed of Yangwui Kong/Thoubal River has its own name corresponding to the respective owners' name. And each waterbed is taken care of by their god/goddesses. Based on a story narrated by one Honsan Kasar, an elder of Chadong village, whenever a person is drowned or carried down by a strong current in the Yangwui

[13] R Doyang Reservoir: A potential IBA in Nagaland, Raju Kasambe, September 2014

https://www.researchgate.net/publication/265651348_R_Doyang_Reservoir_A_potential_IBA_in_Nagaland

Kong/Thoubal River, no god or goddess of any Iren lets the dead body settle on its water-bed with guilt of being responsible for killing. God/goddesses of each Iren therefore passed on the corpse until it reaches his Iren. As it reaches, the god/goddess of the respective Iren owned itself responsible for the dead person and let him settle on its lap and so its current waves out the dead body at the safer corner of the Iren from where people can sail it home.

The Thoubal River is one of the Rivers of Manipur with the most diverse fish varieties. However, several development interventions, such as the Ithai Barrage and the Keithelmanbi Barrage already blocked the seasonal migration of fish varieties to migrate to upstream portion of Thoubal River to breed. This has led to alarming shrinking of fish varieties and also quantities of fish catch. Traditional fish varieties are lost increasingly. The Mapithel dam commissioning will also led to decline of fish varieties and seriously affect fishing activity. The blocking of Thoubal River by Mapithel dam threatens the spiritual sanctity of the River and the traditional belief system of affected communities.

The Meitei and other indigenous communities also depend on the Manpur River for fishing and also for sustaining the water needs of their seasonal agriculture. The Ithai Barrage of the Loktak Multipurpose Hydroelectric Project has blocked the migration of several fish varieties from Chindwin River in Myanmar through the Manipur River. Many fish varieties found in Loktak and Manipur River is part of rituals and ceremonies, such as “Lai Haraoba” of the Meitei people.

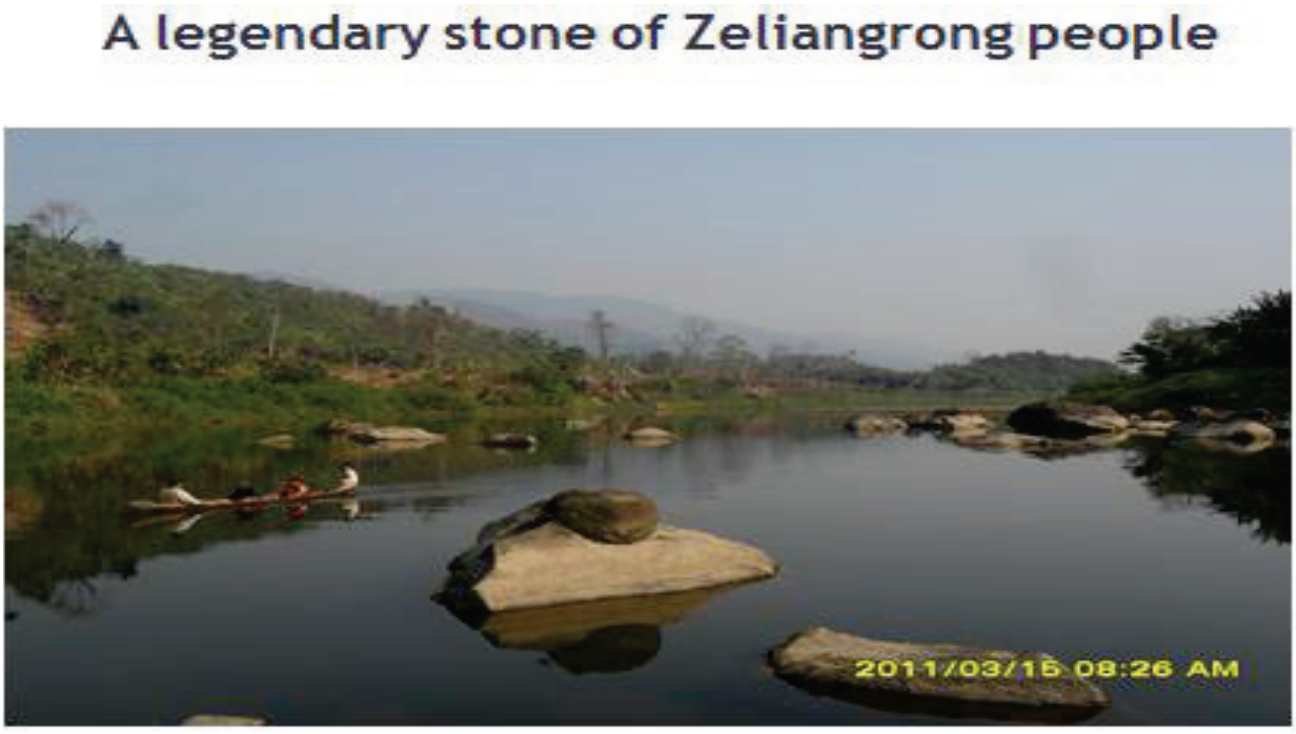


Figure 9: Legendary Stone of Zeliangrong People

The Rongmei and Liangmei people consider Barak as a sacred River, besides it being considered as a giver of life. The legendary sacred stone of the Rongmei people lies in the Barak River. The Barak River sustained agriculture and fishery activities for both Rongmei people and also the Hmar people in Tamenglong and Churachandpur Districts of Manipur.

The Liangmei People referred to Barak River as 'Bieuki' in their traditional dialect, and considers the River as sacred and life giver. Many of their folk songs are dedicated to the beauty, might and strength of the River.

The Barak Water falls is also considered as a sacred cultural space for indigenous Rongmei people. The proposed construction of 1500 MW Tipaimukh Multipurpose Hydroelectric Project, the 190 MW Pabram Hydroelectric Project, the 67 MW Khongnem Chakha Dam etc will disturb the natural flow of the Barak River and also submerged both the survival sources and also the cultural space and sanctity of the Hmar and Rongmei Indigenous Peoples. Similarly, the construction of Khuga dam, Mapithel dam, the Ithai Barrage etc affected the cultural and spiritual sanctity of the Rivers and the cultures and traditions it sustains.

DISCUSSION - KEY DEVELOPMENT PROCESS ON RIVERS OF NORTH EAST WITH FOCUS ON BARAK RIVER BASIN

DEVELOPMENT INTERVENTION– BARAK RIVER BASIN

Several large infrastructures and projects marked the development interventions in Barak River system. Power projects, irrigation project, waterways etc are key development projects interventions in Barak River system. Mega dams are common in all the Rivers flowing either to both Burma and Bangladesh Rivers. For instance, there are several lakes, ponds and reservoirs in the Manipur River basin, which forms a key component of the Barak River Basin, which are increasingly being harnessed to provide water for irrigation, domestic supply, power generation etc. The total area under water bodies is estimated at 14,875 ha which comprises 2.1% of the entire Manipur River basin. At present, there are seven river valley projects out of which three (Singda Dam Project, Thoubal Dam Project and Khuga Dam Project) are multipurpose, one (Loktak Lift Irrigation Project) is major and the remaining three (Khoupum Dam Project, Imphal Barrage Project and Sekmai Barrage Project) are medium irrigation projects. Hydrological data on river basin, in general, has not been properly monitored. The Department of Earth Science, Manipur University, in their report on Geo-environmental Studies of Manipur River Basin in 1996 has indicated the average runoff of Manipur River as 0.5192 million ha. M. against a total catchment area of 6,97,124.5 ha. Potential ground water is estimated around 44 million cu. m. per annum i.e. around 0.0044 million ha. M.

8. The Ithai Barrage over Manipur River

The Ithai barrage on the Manipur River was constructed in 1979 as part of the Loktak multipurpose hydroelectric project. The barrage is 10.7 m. high with 5x10 m. waterways across the Manipur River. The construction of Loktak Multipurpose Hydro Electric Project was taken up by the Ministry of Irrigation and Power in 1971 and was commissioned by the government of India in 1983 with the National Hydro Electric Power Corporation (NHPC) executing the project. The Ithai Dam (a coffer Dam) or barrage was constructed in the downstream of Manipur River (Imphal River) as a part of the Loktak Multipurpose Hydro Electric Project, to maintain sufficient water volume in the Loktak lake by converting it into a reservoir for maintenance of the project to generate 105 MW of power and to provide Lift irrigation. The water stored is transferred through a mountain range, west of the Manipur valley to the narrow Leimatak River, which is 312 m. lower than the Loktak.

The Ithai Barrage has 'permanently' raised the water level of Loktak wetland and has blocked the natural flow of water to and/or from the wetland, severely altering the hydrologic cycle of a delicately balanced system. Before the construction of the Ithai barrage, the natural dredging process continuously cleared the silt brought down by the various streams and rivers from the valley and the hills. The roots of *phumdi* and other aquatic vegetation during the lean season touched the bottom. During the monsoon, the water level and the vegetation rose, bringing silt up with it. Much of this silt was drained out through the Manipur River with the current, together with some of the vegetation or *phumdi*.

In the post-barrage scenario, the water level is sought to be maintained at a particular level throughout the year, resulting in the silting up of the wetland at an unprecedented rate. Other changes to the floating *phumdi* have led to the endangering of native aquatic vegetation, the extinction of native fish species and the thinning and proliferation of the *phumdi*, floating vegetation mass. Prior to the construction of the barrage, the spread of vegetation was kept in check as the excess *phumdi* would flow out every monsoon through the Khordak channel. It is estimated that about 83.450 hectares (may include both settled recorded land and permitted lands)[14] of agricultural lands of both sides of Ithai Dam have been seriously affected. Out of this total area, about 20,000 hectares were used for double cropping purposes[15].

The NHPC, fully aware of the extent of the damages inflicted to the indigenous peoples has failed to take any action for preventing such damages or rehabilitating the affected indigenous peoples since the commissioning of the project in 1983. While preparing the Loktak Hydro Multipurpose Scheme, the concerned parties also failed to consider factors that accelerate shortening the storage capacity of Loktak Lake that will have adverse effects on

[14] S. Ibomcha, Ithai Damgi Ithil, P.3

[15] "Ithai Barrage: A Danger to the Identity of the Peoples of Manipur" D. Naorem Joykumar as contained in India: Manipur: A Preliminary Report on Human Rights in the North East: Compiled by INDEGENE, 1996

the livelihoods of the residents of the area lying near and around the Loktak Lake and paddy fields in and around Loktak Lake. The economic impact of the project to indigenous peoples living in around the periphery of Loktak Lake has never been taken into consideration.

8.1 Mapithel dam over Thoubal River:

The Mapithel dam of the Thoubal Multipurpose Hydroelectric project is one of the most controversial dam built over the Thoubal River. The construction process of Mapithel Dam commenced without taking free prior and informed consent of the affected villagers both in the downstream and upstream areas in 1978. The project approved by the Planning Commission in 1980 at the cost of Rs. 47.25 Crores now stands at Rs. 390 Crores in March 2003 and near 800 Crores in 2008. Rather threats and intimidations, arrest and torture of several affected villagers precedes commencement of the dam construction. Four villages viz. Chadong, Lamlai Khullen, Lamlai Khunou, Lamlai Monbung would be completely submerged by the Dam and another Six villages, Sikiphung, Thawai, Thawai (K), Zalengbung, Sankai, Riha those living in the upstream of the dam just 100-150 metres away from the emerged accumulated water site (river side) would face endemic health problems in the area due to waste, water, air, and soil borne diseases and other hazardous epidemics diseases. The submergence of prime agricultural land along the Thoubal River from the dam site to the town of Litan would further undermine food security of these villagers.

The construction of Mapithel dam commenced without conducting a detailed Health, Environmental, Social, Cultural, Economic and seismic Impact assessment of the Dam on the peoples along the Thoubal River. A detailed Environmental Impact Assessment (EIA), detailing all possible impact of the project on the ecology, environment, human lives in Mapithel Valley and preparation of Environment Management Plan (EMP) outlining environmental protection measures during and after the project commissioning with peoples participation is still absent and the dam construction has also been fraught with violations of India's own policies.

The absence of environmental concerns is actually acknowledged by the Ministry of Environment and Forest, Government of India when it wrote to the Chief Secretary, Government of Manipur on 28 December 2006 to stop further violation by Mapithel Dam construction, noting that the Thoubal Multipurpose Project failed to obtain Environmental and Forest clearances as required under the Environment (Protection) Act, 1986 and Forest (Conservation) Act, 1980 respectively. The site of the Mapithel Dam is also situated at high seismic zone and an epic centre of seismic zone 5. The Government continues to propagate lies on compensation of peoples affected by Mapithel dam. The 1993 Rehabilitation and Resettlement agreement was forged under an environment of threats and intimidation, terms and conditions decided by the state project authorities and to divide affected communities and the implementation of the agreement itself was marred with violations.

The construction of Mapithel dam will further affect the health of Thoubal River and the Manipur River system, contributing to further loss of endemic species.

8.2 Khuga Dam over Khuga River:

The Khuga multi-purpose project is built over the Khuga River and located to the south of Churachandpur town of Manipur. The prime objective of the multi-purpose project is to generate hydro- electricity and to meet the required supply of water in the nearby areas for drinking as well as for the irrigation project. This project was started in the year 1982-83, with an original estimated cost of 15 crores and was scheduled to be completed by 1987. After a lull of 20 years, the construction work of the dam resumed again in 2002, at a revised cost of 381.28 crores and was scheduled to be completed by March 2010. The dam was inaugurated by Congress President, Ms. Sonia Gandhi on 12th of November 2010. The project cost shoots up to 433-crores in 2011 price level; ironically 30 times the estimated project cost since its inception in early 1980s.

8.3 Khoupum Dam over Khoupum River:

The Khoupum Dam Project was constructed in 1978, during sixth plan under the Irrigation and Flood Control Department of the Government of Manipur with an outlay of Rs. 296 lakhs. This is the first dam in northeast India which is constructed in the hill areas. The project comprises of an Earth Dam of 17.11 meters height and around 600 square meter across the Mengchean River, tributary to Irang River, in Manipur. The dam is situated in south eastern part of the Khoupum Valley with a latitude 24°41' north and 93° 33' east longitude which is 145 kms (90.00 miles) away from Imphal, the capital of Manipur passed through the Tongjeimaril (Old Cachar Road). For running the project, the waters streaming down the hill slope are collected in an artificial lake. The main purpose of the project is to provide irrigation water to the rain fed agricultural land of 800 hectares in the valley. It is also to practice double or triple cropping under the programme of Green Revolution. The project is also to encourage the local people to rear fish in the lake as additional source of sustenance to the villagers.

The Khoupum dam project was inaugurated by the then Chief Minister, Yangmaiso Shaiza on July 26, 1978 and the Khoupum dam canal project was commissioned by the then Chief Minister, Rishang Keishing in the year 1982-83. The Khoupum Dam construction work started commissioning from October 1975 and the schedule time for completion is May 1976.

9. Proposed Mega dams over Barak River and its tributaries in Manipur:

The Government of India aggressively has been pursuing the construction of the controversial 1500 MW Tipaimukh Multipurpose Hydroelectric Project across the Barak River in Manipur. Four new mega dam projects are also planned over the River and its Tributaries, the Irang River and the Tuivai River.

In 2001, the Tipaimukh Dam Project was approved by the Governor of Manipur under President's Rule without peoples consent. On 28th December 2002, the Manipur cabinet approved the MoU signed between the Government of Manipur and North Eastern Electric Power Corporation. The then Power Minister of India, Mr. Sushil Kumar Shinde laid the foundation stone for the project on 15 December 2006. Later, a MoU was signed with the Government of Manipur, the National Hydroelectric Power Corporation (NHPC) and Sutlej Jal Vidyut Nigam Limited (SJVNL) on 28th April 2010, reaffirmed on 22nd October 2011, without obtaining the Free, Prior and Informed Consent (FPIC) of all affected communities in Manipur, Mizoram and Assam.

Again on 28 August 2014, four Memorandum of Agreement were further signed by the Government of Manipur with the North Eastern Electric Power Corporation (NEEPCO) for the construction of the 60 MW Irang HEP, 51 MW Tuivai HEP, the 67 MW Khongnem Chakha and 190 MW Pabram HEP projects over the Barak River and its tributaries under the Manipur Hydroelectric Power Policy, 2012.

The Government envisaged constructing a 162.8 meters high rock filled Tipaimukh dam, at about 500 meters downstream of the confluence of Barak and Tuivai Rivers, at a revised project cost of Rs. 8,138.79 Crores at September 2008 price level. The project will also led to massive destruction of forest land and the livelihood of the Hmar people of Mizoram State. A total of approximately 14,634 trees including 11,306 trees below 60 cm girth and another 4.4 million of bamboo columns in 1063.4 hectares of bamboo forest will be permanently lost due to the project in Mizoram. The total loss of trees and bamboo groves in both Mizoram and Manipur due to the submergence by Tipaimukh dam is estimated at over 8 million trees and over 4 million bamboo groves, which is a disturbing and unacceptable figure by any count.

Indeed, the Forest Advisory Committee (FAC), while recommending the rejection of "Forest Clearance" for the mega project in its meeting from 11 – 12 July and 13-14 August 2013, observed that the forest land required for the project is simply disproportionate to the power generation plan of the project and the per-megawatt requirement of Sixteen (16) hectares of forest land for the project is extra ordinarily high. The total forest area to be affected in Manipur, as claimed by the project authorities, the National Both Manipur and Mizoram falls in the Indo-Burma Biodiversity Hotspot , a globally recognized area with rich and diverse flora and fauna species and the Tipaimukh dam project will have direct impact on the extremely valuable and endangered faunal and floral species.

The "Forest Clearance" rejection for Tipaimukh dam also brought into focus the legitimacy of the "Environment Clearance", conceded by the Ministry of Environment and Forests, Government of India on 24 October 2008 despite peoples' objections to Tipaimukh dam in all the five public hearings held from 2004 till 2008. The rejection of forest clearance also confirms that the "Environment Clearance" is based on incomplete assessment of impacts of forest loss and especially on communities livelihood dependence, with due and rightful participation of all affected communities.

The proposed Tipaimukh dam will submerge 25,822 hectares of forest in Manipur and 7.8 million trees and 27,000 bamboo groves will be felled. These forested areas are critical habitats of birds and wildlife with many endangered species including gibbons, leopards, grey sibia, barking deer and the rufous-necked hornbill. The confiscation of nearly 25,822 hectares of forest land will seriously undermine the food security and sovereignty of the indigenous peoples of Manipur who depend on the forest for their food, medicines, seasonable fruits and vegetables and other forest products.

The site selected for Tipaimukh project is one of the most active in the entire world, recording at least two major earthquakes of 8+ in the Richter scale during the past 50 years. The proposed Tipaimukh HEP is envisaged for construction in one of the most geologically unstable area as the proposed Tipaimukh dam axis falls on a 'fault line' potentially active and possible epicenter for major earthquakes.

10. Nagaland

10.1 Doyang Dam-Nagaland

Figure 10: Doyang Dam in Nagaland

The Doyang Dam is built across the Doyang River near the Wokha village in Nagaland. Doyang is a rock fills dam and hydroelectric project with a design capacity of 75 MW, on the Doyang River, a tributary of the

Brahmaputra, 26 km from Wokha town, the district headquarters. The power plant is run by the North Eastern Electric Power Corporation (NEEPCO). It is a rock fill dam with a height of 92m. Doyang Reservoir is user for power generation, fisheries and also provides shelter to flora and fauna around.[16] The Doyang Reservoir was created during the construction of the dam for Doyang Hydro Electric Project, in Wokha district, Nagaland.

10.2 Dikhu HEP (140 MW) Nagaland

The Dikhu HEP was envisaged as a storage scheme by constructing a 98 m high dam and dam toe powerhouse for an installed capacity of 140 MW. A 98 meter high concrete gravity dam has been proposed located just downstream of confluence of Dikhu and Yangnyu river at longitude 940 46' 59.4" E and latitude 260 39' 29.3" N. The length of the proposed dam at top is 305 m.

Figure 11: Dikhu HEP in Nagaland

These 305 metres consists of 126.4 metres overflow section, 48 m of Power dam and 130.6 m of non-overflow section. The proposed Coffer dam will be located approximately 150 m upstream and 200 m downstream from the dam axis. Spillway with 8 nos. radial gates of size 11.3 x 12 m has been proposed for a design flood of 12880 m3/s. Intake gate of size 3.3 m x 3.3 m with semicircular trash rack has been planned for carrying the water to the Powerhouse. 4 nos. of Penstock of diameter 3.3 m and 110 m long each has been planned[17]. The PFR was submitted in March 2008, while the EIA / RMP were submitted in August 2008. The Detailed project report has already been prepared.

Proposed Water Way Plan in Tizu River, Nagaland

The Tizu River in Nagaland is being considered by the Government of Nagaland and the Government of India for development of an inland waterway as Part of India's Look East Policy, towards facilitating connectivity with neighboring Burma to facilitate trade and commerce with South East Asian countries. Following the state government's decision to develop River Tizu under centrally sponsored scheme (CSS), a team of officials from

[16] http://www.walkthroughindia.com/walkthroughs/the-8-mega-dams-of-north-east-states-of-india/
[17] http://www.lahmeyer.in/dikhu-hep-140-mw-nagaland-india/

Inland Waterways Authority of India (IWAI), Ministry of Shipping and from the state planning department recently visited the River and inspected the River from as many points as possible and examined the viability of undertaking a hydrographic survey all across the length of the river, which would form the basis for preparation of a DPR for further development of the river under CSS. The development of IWT in Tizu River is part of "Look East Policy" of the government of India. IWAI team members conducted hydrographic survey in February 2015. The team observed that the river had very good potential for its development for Inland Water Transport (IWT) operation and in the future could provide India and Nagaland connectivity with Hthimathi Port of Myanmar, through the Chindwin River. It is projected that border trade in Nagaland will be a boost once the two river routes are declared as national waterways[18].

11. Construction of Myntdu Leshka Hydroelectric Project in Meghalaya

The Myntdu Leshka Hydro Electric Project is a Run off River (ROR) Scheme, located at the Jaintia Hills District of the State of Meghalaya. The project envisages construction of the 63 meters' height dam across the Myntdu River, just below the tri junction of its two other tributaries, the Lamu and the Umshariang. The investigation work of the Myntdu Leshka Stage I Hydro Electric Project (2 x 42) MW was taken up by the Board during 1975-76 and the final Revised Detailed Project report (DPR) was submitted to the Central Electricity Authority (CEA) for clearance, in October 1998. The public hearing for Environmental Clearance conducted by the Meghalaya Pollution Control Board (MPCB) was held in March 1999. The Techno Economic Clearance was issued by the CEA on 20th September 1999.

Map No 3: River of North Eastern India

[18] "Tizu, Zungki river routes identified for national tag",

DIMAPUR, NOV 21(NPN), Published on 22 Nov. 2015

The necessary Forest Clearance, subject to certain conditions, has been accorded by the MOEF on 19 June 2001. The MOEF accorded Environmental Clearance on 20 September 2001. While the provisional clearance was received in June 2002, the final clearance was accorded in May 2004[19].

The Myntdu Leshka Dam has seen series of crisis, cost overruns, flooding of dam and powerhouse and tunnel in the year 2009 and 2010 several times, loss of lives of labourers working in the dam construction, controversies of financial and environmental implications of adding an additional power generating unit than originally planned. Other than the reason of the dam a clear cut case of violating the additionality criteria clause for CDM projects, the dam also presents a case where a debt ridden dam developer actually seeks carbon credits from CDM to recuperate their cost overrun of their project.

The Myntdu Leshka has been criticized widely as technical flawed project, lacking adequate appraisal as its dam, power house and tunnel continues to be flooded repeatedly in the year 2009 and 2010. In the 2007 and 2008, heavy rainfall in the catchment area of the river led to flooding of the dam, badly affecting its electrical system. There were reports that the high acidic content of the Myntdu River had damaged certain machinery being used in the project, further delaying the project completion.[20] Again in May 2010, rainfall destroyed equipment of the project with water overflowing from the Lynriang, which many believed it is due to encroachment of the third unit of the project into the river bed.[21] Another concern is that the dam will be built on a limestone foundation, threatening its long-term viability. Indeed, the MoEF had initially sent back the proposal for environmental clearance of the project to MeSEB, citing concerns about the very low pH value of the water, which indicates high acidity due to upstream coal mining.[22]

The flooding of dam and power station on 8 October 2009 claimed the lives of ten labourers of the SEW Construction Limited working at the dam[23]. The MeSEB admitted that the gushing water from catchment areas of the Myntdu Leshka Dam caused wide damage to the tunnel and the power house.[24] The incident itself and subsequent non-disclosure of the inquiry report revealed the lack of concern for safety, security and human rights of the workers of the dam, the lack of adequate appraisal of the project, the lack of transparency and

19 "Myntdu Leshka Hydro Electric Project", Meghalaya State Electricity Board
http://meecl.nic.in/leshka.htm
20 "March 19 flood delayed commissioning of Leshka project" 15 June 2011, The Meghalaya Times
21 "Hydel project inundated", The Telegraph, 23 March 2011
http://www.telegraphindia.com/1110323/jsp/northeast/story_13751583.jsp
22 "Meghalaya – Biodiversity Conservation and Dams", The Ecologist, 2003
http://www.northeastvigil.in/specials/the-dams-issue/ecologist-2003/475.html
23 Meghalaya dam toll touches nine, six workers still missing
The Times of India, the 14th October 2009
24 Rescue operation resumes to trace missing people in Dam accident, 11 October 2009

accountability of the project authorities and denying space and opportunity to make initiate appropriate rectifications of the project with due participation of the people.

12. Dumbur Dam over Gumti River, Tripura

A 30 metre high gravity dam was constructed across the river Gumti about 3.5 kilometers upstream of Tirthamukh in south Tripura district for generating 8.6 megawatts of power from an installed capacity of 10 MW. The dam submerged a valley area of 46 sq km. This was one of the most fertile valleys in an otherwise hilly state, where arable flatlands suitable for wet rice agriculture are extremely limited. Official records suggest 2558 families were ousted from the Gumti project area – these were families who could produce land deeds and were officially owners of the land they were ousted from. Unofficial estimates varied between 8000 to 10,000 families or about 60 to 70 thousand tribes-people displaced[25].

Most of those ousted by the Dumbur failed to get any rehabilitation grant and were forced to settle in the hills around the project, returning to slash-and-burn agriculture called jhum.

The dam destroyed the once surplus tribal peasant economy of the state. Tripura's leading economist Malabika Dasgupta has shown in her study on the Gumti hydel project that "attempts either to protect the environment to the exclusion of considerations for the wellbeing of the people or to improve their level of wellbeing without consideration for the environmental impact of such policies can neither protect the environment nor improve the standard of living of the people".

Before the dam, the hills around the present project area were sparsely populated and the area was almost wholly under dense forest cover supporting wildlife. The Tripura Gazetteer of 1975 talked of sighting 'large herds of Indian elephants in the Raima-Sarma region along with some tigers and bears in the dense forests'. Dasgupta writes that the area "was an abode of deers, bears, wild boars, tigers, elephants and a wide variety jungle cats". The region was rich in flora and fauna.

However, after the Dumbur Dam was commissioned, not only did almost half of the tribal families displaced by the Dam move into the hills in the river's upper catchment area, but the roads built to first transport construction material and then to support the Hydel project opened up the rich forests of the area to illegal logging. The surplus-producing tribal peasantry was forced to revert back to slash-and-burn jhum cultivation that has caused

[25] The Dam and the Tribal _May 2004, Himal South Asian

http://old.himalmag.com/component/content/article/1734-The-Dam-and-the-Tribal.html

irreparable damage to the ecology of the upper catchment areas of Gumti River. The upper catchment of the Gumti comprises of 11 Gaon Sabhas - nearly 60 villages in all – in the Gandacherra block of Tripura's newly formed Dhalai district. The upper reaches of the catchment area is steep and hilly, but as it flows towards Tirthamukh it is flanked by small flat-topped hills locally called tillas with many lungas or lowlands between them. Before the commissioning of the hydel project, the upper catchments supported a small population of tribals. There are clear demands for the Gumti hydel project to be decommissioned as the project has failed to generate any electricity.

13. Kaladan Multi-modal Transit Transport Project in Mizoram

The Kaladan Multi-Modal Transit Transport Project is a project that will connect the eastern Indian seaport of Kolkata with Sittwe seaport in Myanmar by sea. It will then link Sittwe seaport to Paletwa in Myanmar via Kaladan river boat route and then from Paletwa on to Mizoram by road transport[26]. Originally, the project was scheduled to be completed by 2014, but completion is delayed.

The Kaladan Multimodal Project is being piloted and funded by the Ministry of External Affairs of India. The preliminary feasibility studies were carried out by Rail India Technical and Economic Services (RITES). Construction work on Sittwe port and the boat jetty in Paletwa, as well as the dredging work, will be executed by the Inland Waterways Authority of India (IWAI), with Essar Projects Ltd, a division of the Essar Group appointed in May 2010 as the main contractor.[6]

The project includes a waterway component of 158 km on Kaladan River from Sittwe to Paletwa in Myanmar and a road component of 109 km from Paletwa to Zorinpui along the India-Myanmar border in Mizoram. The project has several sections/legs: 539 km shipping route from seaport of Kolkata in India to Sittwe seaport in Myanmar via Bay of Bengal, 158 km river boat route from Sittwe seaport to Paletwa jetty via Kaladan river in Myanmar, 110 km road route from Paletwa jetty to Indo-Myanmar border in Myanmar and a 100 km route from Indo-Myanmar border to Lawngtlai in Mizoram in India by road on National Highway 54 (India) (NH-54), which then continues further to Dabaka in Assam via 850 km long NH-54 which in turn is part of the larger East-West Corridor connecting North East India with the rest of India.[4]

14. Community Responses to development interventions along Rivers flowing in Burma and Bangladesh

The Government has failed to respond positively to numerous representations against the Tipaimukh High Dam. The submissions by various civil society groups, human rights organizations, village authorities etc on 19 March 2003 to NEEPCO objecting the construction of Tipaimukh HEP in response to call for submission under Section

[26] https://en.wikipedia.org/wiki/Kaladan_Multi-modal_Transit_Transport_Project

29 of the Electricity (Supply) Act remains unresponsive. On 11 July 2005, the Aizawl-based Centre for Environment Protection (CEP) has strongly demanded of the Mizoram government and NEEPCO for the withdrawal of their petition for diversion of forest land for non-forest purposes from the Ministry of Environment & Forest to pave way for implementation of the controversial Tipaimukh Hydro-electricity (multi-purpose) project. Concerns expressed by affected villagers in the downstream portion of Barak River, mostly in Bangladesh, remained unheard. On March 9, 2005, the National Committee for Resisting India River Aggression, Dhaka, Bangladesh, launched a protest march towards Jakiganj in Sylhet from Dhaka to protest against the construction of a dam at Tipaimukh on the river Barak, the water source of Surma, Kushiara and Meghna rivers. An International Tipaimukh Conference at Dhaka in December 2005 also strongly objected the construction of Tipaimukh High Dam, seriously viewing the absence of consultation and participatory impact assessment in both the upstream and the downstream portion of Barak River. The Citizens Concern for Dams and Development, the Sinlung Indigenous Peoples Human Rights Organization, Hmar Students Association, Naga Women Union etc held series of community meetings and resolved to respect indigenous peoples' rights and to strictly adhere to the recommendations of the World Commission on Dams, 2000 for all decisions on Tipaimukh dam.

The Tipaimukh dam concerns have also been raised consistently in several human rights forums of the United Nations, including the UN Permanent Forum on Indigenous Peoples and at the UN Human Rights Council and other UN Treaty bodies by members of the Citizens Concern for Dams and Development. Specifically, the United Nations Committee on the Elimination on all forms of Racial Discrimination wrote to the Government of India on 2 September 2011 from its Chairperson, recommendations the Government to respect the Right to Free Prior and Informed Consent of Indigenous Peoples before construction of Tipaimukh Dam.

The Sinlung Indigenous Peoples Human Rights organization has called for scrapping the proposed Tipaimukh dam that will submerged an extensive tract of forest land in Mizoram. Likewise, the Sinlung Indigenous Peoples Human Rights Organization has expressed concern with the violations involved in the construction of the Tuirial Hydroelectric Project in Mizoram, built over Tuirial River. The Sinlung Indigenous Peoples in their memorandums to the Prime Minister of India on Turial Project has repeatedly expressed concern that corporate bodies, politicians, contractors and elites etc were harnessing undue benefits by destroying indigenous peoples land, river, forest and their resources etc.

The environment clearance for proposed Tipaimukh dam construction cleared by the Ministry of Environment and Forest of the Government of India on 24 October 2008 despite objections of the affected villages in all the five public hearings held for the proposed dam at Tamenglong, Keimai, Mizoram, Tipaimukh and Churachandpur districts from 2004 till March 2008 also has been rejected by affected communities. Communities affected by Tipaimukh dam has long been objecting proposed Tipaimukh Dam, especially after suffering failed promises and traumatic experiences from NHPC's Loktak Multipurpose Hydroelectric Projects, which still continues to remain

unresolved. Affected communities expressed severe opposition to all the five environmental public hearings held for Tipaimukh Dam and indeed, the Public Hearing at Keimai village on 26 March 2008 cannot be held due to massive community protest. Of Late, communities resolved and protest rallied against Tipaimukh dam construction on 14 March 2012 at Nungba town on International Rivers Day.

Communities affected by the Ithai Barrage of the Loktak Multipurpose Hydroelectric Project have for long raised strong concern with the project. Community organizations such as the All Loktak Lake Area Fishermen Union, Citizens Concern for Dams and Development and the Committee on the Protection of Natural Resources in Manipur etc has long been demanding the decommissioning of the Ithai Barrage due to the multifaceted impacts on the lives of fishing communities depending on Loktak wetlands and also to the ecology of the wetlands and further due to the lack of accountability and responsibility of the project authority, the National Hydroelectric Power Project. The call for decommissioning is also a result of continued imposition of restriction on fishing communities' access and from pursuing their basic survival and livelihood dependence activities in Loktak Wetlands.

The Mapithel Dam Affected Villagers Organization has long been addressing the multifaceted impacts of Mapithel dam and called for a full scale review of the Mapithel dam construction to ensure its compliance with human rights and indigenous peoples rights standards and further to also comply with the recommendations of the UN Special Rapporteur on Indigenous peoples rights in the year 2009 and also in 2015 to respect the right to free, prior and informed consent of all affected communities.

In Tripura, the Borok Peoples Human Rights Organization has repeatedly urged upon the Government of Tripura (BPHRO) and the Government of India to decommission the Dumbur Dam. The call of BPHRO was endorsed and reiterated in a North East consultation on protection of Natural Resources, organized by BPHRO, North East Dialogue Forum, Committee on the Protection of Natural Resources in Manipur, held at Agartala in 2013, through the adoption of the Agartala Declaration.

In Meghalaya, indigenous organizations such as the Civil Society Women Organization (CSWO) raised concerns with the violations associated with the Myntdu Leshka Hydroelectric Project, over the corruption, loss of lives of the workers and impacts on riverine ecology of Myntdu River etc. In Nagaland, several community organization and human rights groups have expressed concern with the social and environmental impacts due to the Doyang project.

INTER-STATE WATER CONFLICTS IN NORTH EAST INDIA

The proposed plans to build mega dams across the Rivers in North East, especially those flowing to Bangladesh has met with wide expression of concerns and objections. The proposed plan to build the 1500 MW Tipaimukh Multipurpose Hydroelectric Project over Barak River in Manipur has provoked widespread condemnation from Bangladesh, due to widespread downstream impacts. Indeed, the concerns and critiques of Tipaimukh dam to be built in Manipur is moving beyond imposed frontiers, the traditional expression of concerns once confined limitedly in Manipur and parts of Bangladesh now resonates from afar. Never had Tipaimukh Dam been focus of international diplomacy, media attention, intelligentsia critics, environmentalist and those with high tentacles as in 2009. The Prime Ministers of India and Bangladesh discussed the contentious issue of the Tipaimukh dam even at the Non Aligned Movement (NAM) summit, July 2009 in Egypt. The contentions of Tipaimukh dam has been discussed from the confines of Manipur Legislative Assembly sessions to the British and Bangladesh parliamentary debates to the deliberations of several United Nations human rights forums. The Tipaimukh dam issue currently continues to dominate the domain of political, media, intellectual and civil society's discourse in Bangladesh with a unilateral demand for revocation of India's decision to build the project over Barak River. Massive rallies, protest meetings, strikes and other forms of protest against the dam continues to gain momentum in Bangladesh.

The Tipaimukh Dam concern is not a recent phenomenon as the first international Conference on Tipaimukh Dam, held way back at Dhaka in December 2005, resolved against the project. The peoples' concerns in Bangladesh are based on their bitter experience of severe water shortage and multifaceted impacts after commissioning of Farakka Barrage over the Ganges River by India. Concerns raised include staggering environmental degradation, economic crisis and hydrological drought. The damming of Barak River, seriously limiting free flowing Surma and Kushyara rivers will disrupt agriculture, irrigation, drinking water supply, navigation etc and reduce recharge of ground water during lean season, affecting all dug wells and shallow tube wells. Bangladesh gets 7 to 8 percent of its total water from the Barak River. The Surma-Kushyara River, which the Barak River bifurcates into, with its maze of numerous tributaries and distributaries support agriculture, irrigation navigation, drinking water supply, fisheries, wildlife in the entire Sylhet division and in peripheral areas of Dhaka division and also supported industries like fertilizer, electricity, gas. The dam would also leave millions jobless with the drying up of the two Rivers. Millions of people are dependent on hundreds of water bodies, fed by the Barak, in the Sylhet region for fishing, agriculture and allied activities. The Barak-Surma-Kushyara is an international river with Bangladesh as a lower riparian country having rights over any decision over River. "Construction of a dam at Tipaimukh would be a death-trap for Bangladesh, it rather involves the very existence of the lives of the 15 Crore people of the country," Bangladesh National Party (BNP) vice president Hafizuddin Ahmed asserted.

The Indian Government's response to Bangladesh concerns has long been marked by a state of denial. Indeed, the Indian High Commissioner Pinak Ranjan Chakrabarty's statement on 21 June 2009 at Dhaka, indicating the absence of an international law that could prevent India from constructing the Tipaimukh Dam and also his assertion of Bangladesh's concerns on the proposed dams, are based on ignorance, provoked an intense resentment in Bangladesh even calling for his expulsion. Experts counter reacted his statement as totally erroneous in view of the status of the 1996 Indo-Bangladesh Ganges Water Treaty and the applicability of the 1997 UN Convention on the Law of Non-Navigational Uses of International Watercourses. Bangladesh experts though agreeing that it is not yet binding as an "international treaty" law, opined there is every reason to argue that the Convention, being adopted by a vote of 103 – 3 in the UN General Assembly, is applicable as "evidence of international customary law" to Tipaimukh dam or any such project on shared rivers. The 1997 Convention put heavy emphasis on comprehensive cooperation for equitable utilization of any trans-boundary watercourse, no-harm to all the co-basin states, and adequate protection of the watercourse itself. Sensing a political crisis in South Asia over Tipaimukh Dam, the U.S. Ambassador to Bangladesh, James F Moriarty even urged the people and the government of Bangladesh to discuss with India to settle the Tipaimukh dam issue," while speaking at a discussion on 'Engaging South Asia: Obama's South Asia Policy,' held in Dhaka.

The Governments of India and Bangladesh formed a Sub Group on 28 August 2012 and also to prepare Terms of Reference for joint surveys between the countries to assess the impacts of proposed 1500 MW Tipaimukh Dam over Barak River. The agreement indeed, came just a day later of India offering Bangladesh a grant of US dollar 200 Million out of one Billion US dollar stipulated aid and after a change of guard in Bangladesh Government. The functioning of the Sub Group remained secretive and the rightful participation of communities depending on Barak River for their survival in the surveys and any negotiations thereof, continues to be a longstanding demand and challenge. Communities demand is that both India and Bangladesh should desist from inking any agreement for Tipaimukh dam construction without the free, prior and informed consent of affected communities in both upstream and downstream areas as the project is potentially rife to cause conflicts between states, between state and indigenous peoples and between indigenous peoples all over the control and management of resources.

Similarly, the Government of Bangladesh also expressed concern with the plans to build mega dams over the Rivers of Meghalaya flowing into Bangladesh, especially the plans to commission the Myntdu Leshka Hydroelectric Project. Bangladesh sent a letter to authorities in India to express its objection to the construction of two hydroelectric dams on two rivers in Meghalaya in December 2012. A senior official of the water resources ministry of Bangladesh was quoted by a TV channel as saying, "We have learnt that India is planning to build two dams to produce hydroelectricity on Umiew and Myntdu rivers in Meghalaya state, which they cannot do without prior consultation with the downstream country." The official added, "We asked them not to proceed with the projects" as "these two are common rivers and Bangladesh will not allow any construction on any common river without a proper study (of the consequences)." The Bangladesh foreign ministry has sent an official letter to the

external affairs ministry. "We will raise the issue at different platforms in addition to the operational level meetings of the Joint River Commission," said a Bangladesh foreign ministry official. If no feedback is received from India soon, Bangladesh will raise the issue during a Foreign Office Consultation or Joint Consultative Commission[27].

ASSESSING STATE OF HEALTH OF NE RIVERS

(Indicators B = blue for healthy, P = Pink for threatened, R = Red for sick)

Table 2: Health Assessment of Rivers [1]

Name of River	Good vegetable	Barrage Anicuts	Dams	Polluting Influence	Embankment	Cities
Barak River	B	R	R	B	B	B
Manipur River	B	P	P	P	B	B
Myntdu River	B	B	P	B	B	B
Someshwari River	B	B	B	B	B	B
Kynshi River	B	B	R	B	B	B
Umngot River	B	B	P	B	B	B
Piyain River	B	B	B	B	B	B
Tizu River	B	B	B	B	B	B
Doyang River	B	B	P	B	B	B
Dikhu River	B	B	B	B	B	B
Dhansiri River	**B**	B	B	B	B	B
Gumti River	B	B	B	B	B	B
Manu River	B	B	B	B	B	B
Feni River	B	B	B	B	B	B
Kaladan River	B	B	B	B	B	B
Karnafuli River	B	B	B	B	B	B

[27] Bangladesh objects to India's plans to build dams in Meghalaya

27 December 2012, Rediff.com
http://www.rediff.com/news/report/bangladesh-objects-to-indias-plans-to-build-dams-in-meghalaya/20121227.htm

(Indicators B = blue for healthy, P = Pink for threatened, R = Red for sick)

Table 3: Health Assessment of Rivers [2]

Name of River	Status of Ground / Surface	River at mount / delta	Peoples connect with river	Pollution	Protected area / special sites	Peoples action	Conflict over the river
Barak River	B	B	B	B	P	P	P
Manipur River	B	B	B	B	B	P	P
Myntdu River							
Someshwari River							
Kynshi River							
Umngot River							
Piyain River							
Tizu River							
Doyang River							
Dikhu River							
Dhansiri River							
Gumti River							
Manu River							
Feni River							
Kaladan River							
Karnafuli River							

DEFORESTATION IN NORTH EAST INDIA AND IMPACT ON RIVER FLOW:

The northeastern part of India, known for its diverse and most extensive lush forest cover, is one of the major regions facing severe deforestation. Forests of this region are unique structurally and species composition. It is a meeting region of temperate east Himalayan flora, palaeo-arctic flora of Tibetan highland and wet evergreen flora of south-east Asia and Yunnan forming bowl of biodiversity. It has been identified as one of the 18 biodiversity hot spots of the world. The region is broadly classified as six major forest types: Tropical moist deciduous forest, tropical semi evergreen, tropical wet evergreen, subtropical, temperature and Alpine.

Forest and forest ecosystems of north-east India are under severe pressures, both from biotic and abiotic factors, due to population explosion, encroachments on forest lands, loss of forest cover for other non-forest uses, degradation caused by illicit felling, lopping for fuelwood forest and fodder, removal of forest cover for litter, forest fires etc.

According to a report from the India State of Forest Report 2015, there has been a decrease of 628 sq km of forest cover in the North East region, which is a matter of worry. The report said there has been a net decline of 628 Sq. Km. in the forest cover since 2013 in the North East. According to current assessment, the total forest cover in the North East is 171,964 Sq. Km, which is 65.59 per cent of its total geographical area, in comparison to the national forest cover of 21.34 per cent. Very dense, moderately dense and open forest cover constitutes 14.81 per cent, 43.85 per cent and 41.34 per cent, respectively, the report said. Among the North Eastern States, Mizoram has recorded the highest decrease in forest of 307 sq km, followed by Nagaland 78 sq km, Arunachal Pradesh 73 sq km, Tripura 55 sq km.[28] According to an earlier 1995 estimates, the states including Arunachal Pradesh, Assam, Meghalaya, Manipur, Mizoram, Nagaland and Sikkim accounted for a loss of 791 sq. km area in two years viz. from 1993 to 1995. The Global Forest Watch (GFW) also showed its findings that India as a whole lost about 842,200 hectares of forest between 2001 and 2012. Out of this, about 548,440 hectares was lost from northeast India alone[29]. According to an official estimate based on satellite images (survey report of FSI), northeastern region has 1, 63,799 km2 of forest, which is about 25% of the total forest cover in the country (Anon., 2000).

The management of the forest has suffered in the recent past due to pressure on land, decreasing cycle of shifting cultivation, exploitation of forest for timber and lack of scientific management strategy. Several studies have attributed key general factors leading to forest fragmentation in the northeast region, including – jhum cultivation, human population pressure, industrial logging and weak government policies.[30] The forest loss is aggravated due to the indiscriminate felling of trees for meeting the raw material needs of industries, surviving on production of paper and pulp, plywood, and match sticks. The proliferation of forest-based industries and commercial crops in many parts of the Northeast hills has been dramatic, especially over the past decades. Financed by traders from lowland areas, tribal cultivators are being encouraged to plant jhum lands with broom grass, pineapple, ginger and

[28] Deforestation becomes dangerous trend in Northeast, Dec 30, 2015, Nagaland Page http://www.nelive.in/nagaland/news/deforestation-becomes-dangerous-trend-northeast

[29] Disappearing oasis: northeastern India losing forests as people move in, 18 November 2014 / Sandhya Sekar. https://news.mongabay.com/2014/11/disappearing-oasis-northeastern-india-losing-forests-as-people-move-in/

[30] Forest cover and assessment in North East India issues and policies, By Geospatial World, December 13, 2010, P. S. Roy & P. K. Joshi, Indian Institute of Remote Sensing (NRSA)

other crops that may not be sustainable given the terrain and soil fertility. While such crops generate cash in the short term, the potential collapse of these farming systems could leave upland communities with a disturbed and unproductive land base that is dominated by scrub bamboo and shrubs. Further, diversion of jhum land to cash crops reduces the pool of fallowed forests for swidden farming, ultimately shorting the fallow cycle and undermining the sustainability of traditional agricultural systems.

The Brahmaputra valley sandwiched between eastern Himalaya in the north, Garo/Khasi/Jaintia and Mikir/Cachar/Barail hills ranges in the south; is a meeting ground of the temperate east Himalayan flora and the wet evergreen and wet deciduous floristic elements. The Khasi-Jaintia hills function as a corridor of the south-east Asia floristic elements into the Indian subcontinent through the Arakan arc. The altitudinal variation and rainfall patterns of southwest and northeast monsoon play a significant role in the development of ecological niches in North East region.[31]

Over-exploitation, habitat loss and fragmentation are the three major factors that threaten the biodiversity of this region. In Meghalaya, the degradation activities viz., clear felling of forests for timber and mining has altered the natural landscape to a great extent. This has resulted in fragmentation of the landscape and loss of many endemic species of Meghalaya. Further, the problem has been getting worse through the indiscriminate felling of trees to satisfy the ever-growing hunger of industries surviving on forest products such as paper and pulp, plywood, match stick, etc.

Commercial logging is another common form of deforestation in cutting trees for sale as timber or pulp. In Garo Hills, lots of legal as well as illegal wood - mill has been increasing in recent times for which we are losing very valuable trees at a faster rate. Again, huge rate of forest are cut down to build roads.

Mining is also playing a significant cause of deforestation in Garo Hills. Meghalaya has an estimated coal reserve of 559 million tones, which are spread over in an area of 213.9 sq. km covering approximately 1% of the total geographical area of the state. The Garo Hills district has the highest coal reserve of 390 million tones, followed by West Khasi Hills (98 million tons), Jaintia Hills (3 9 million tons) and East Khasi Hills districts (31 million tons)[32]. Logging roads enable landless people to access the interiors of the forest, which in turn results in further deforestation and poaching[33].

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[31] Anonymous 1996. State of Forest Report 1995. Forest Survey of India, Dehradun.
Anonymous. 2000. State of Forest Report 1999. Forest Survey of India, Dehradun.
Anonymous. 2002a. Biodiversity Characterization at Landscape level in North-East India using Satellite Remote Sensing and Geographical Information System. Indian Institute of Remote Sensing, Dehradun.

[32] Deforestation in Garo Hills and its impact, Manoj Kumar Hazarika, Lecturer, Department of Economics, Tarabhusan Pal Junior Science College, Karimganj, Assam

[33] The Echo, ISSN 2278 – 5264, Volume - I, Issue - IV, April 2013, Page 158

Extensive deforestation has also led to reduced rainfall in the region. Remote sensing satellite data and regional climate models, IIT Bombay researchers have found that deforestation (converting woody savannah to crop land) in northeast India and north-central India has led to a 100-200 mm reduction in summer monsoon rainfall in these two regions. The land use information is based on satellite data for two time periods — 1980-1990 and 2000-2010. The results were published on August 24 in the journal *Scientific Reports*.[34] "Because of deforestation, there is 1-2 mm reduction per day in rainfall during the end of the monsoon in the Ganga Basin and northeast India," says Prof. Subimal Ghosh, the corresponding author of the paper from the Interdisciplinary Program in Climate Studies, IIT Bombay.

As a result of the large-scale conversion of forest land to crop land, particularly tea plantations in northeast India, there has been a 20 per cent reduction in green cover in the core monsoon zone. Also, the deep-rooted vegetation of the forest trees, which has a higher water intake capacity resulting in increased evotranspiration, has given way to more shallow-rooted vegetation. These two factors have led to a reduction in evotranspiration and, in turn, rainfall at the end of the monsoon period[35].

The reduced precipitation has affected the water flow of the major rivers of North East India. Almost all Rivers of North East India are affected by reduced flow of Rivers. The extensive deforestation has also led to emergence of a new phenomenon, of increased floods in monsoon periods. The disappearances of forest can no longer hold back the rain waters especially in heavy rains, as against the scarcity of water in winter period. Villagers of Pabram Village in Tamenglong District shared that the flow of Barak River has changed. The fluctuation of water level in Barak River is drastic. The Barak River, whose water level increase and decrease used to be gradual in earlier times, today witness drastic water flow level changes. In winter, the water flow is much minimal. This even threatens the very existence of dam reservoirs. While there's excess water in summer, there's scarcity of water in winter times, which will undermine in fulfilling the objectives and performance of the dam.

CONCLUSION:

Several Rivers of North East India flows either to Bangladesh and Burma, which includes the Barak River, Manipur River in Manipur, the Kaladan River in Mizoram, the Tizu, Doyang River in Nagaland, the Myntdu River in Meghalaya, Gumti River in Tripura etc. There's few Rivers in the region which continues to flow free, as most of these Rivers are targeted for mega development projects, such as hydroelectric projects, irrigation project, waterways etc. The Manipur and the Barak River system are mostly targeted for Hydroelectric generation and

[34] Deforestation caused reduced rainfall in Ganga Basin, NE India, R. Prasad http://www.thehindu.com/sci-tech/science/deforestation-caused-reduced-rainfall-in-ganga-basin-ne-india/article9025901.ece

irrigation project, while trans-boundary Rivers of Nagaland and Mizoram, such as Doyang River, Tizu River, Kaladan River, Tuivai River are targeted for both hydroelectric project and water way projects. The Rivers of Meghalaya and Tripura are targeted primarily for hydroelectric projects. Several mega dam projects and water ways projects are pursued as part of development projects facilitating the full-fledged implementation of India's Look East Policy, towards fostering trade and commerce with neighboring countries in South and South East Asia. Increased deforestation and the pursuance of large scale unsustainable development projects seriously undermined the health of the ecology of these Rivers.

The pursuance of these mega development projects over Rivers of North East are laden with controversies of negating the significant role of these rivers in sustaining the livelihood and survival of indigenous communities inhabiting the region and also in fostering the sustenance of the rich and unique biodiversity of the region. Impact on fisheries and riparian ecology of these transboundary Rivers and the accountability of the stakeholders involved in pursuance of these development processes continues to linger. Mega dams already built and also proposed over trans-boundary Rivers such as the Myntdu Leshka Hydroelectric Project in Meghalaya and the 1500 MW Tipaimukh Multipurpose Hydroelectric Project in Manipur are subjected to widespread opposition from communities in downstream areas in Bangladesh.

There has been growing call and assertion from indigenous communities depending on these trans-boundary to recognize their intrinsic survival dependence over these Rivers and the correlation of these Rivers with the unique natural heritage and sanctity of the region and also to ensure full adherence to best development standards and practices in promoting development policies or projects affecting the health of the Rivers and their inalienable relationship with indigenous communities in the region. Ensuring the rightful participation of communities in development decision making affecting their Rivers, forest and land is crucial towards ensuring the health of the Rivers of North East.