It required the labour of thousands of years for us to learn a little of how to calculate the more remote natural effects of our actions in the field of production, but it has been still more difficult in regard to the more remote social effects of these actions... What cared the Spanish planters in Cuba, who burned down forests on the slopes of the mountains and obtained from the ashes sufficient fertilizer for one generation of very highly profitable coffee trees - what cared they that the heavy tropical rainfall afterwards washed away the unprotected upper stratum of the soil, leaving behind only bare rock! In relation to nature, as to society, the present mode of production is predominantly concerned only about the immediate, the most tangible result; and then surprise is expressed at the more remote effects of actions directed to this end turn out to be quite different, are mostly quite the opposite in character...

-Frederick Engels, *Dialectics of Nature*

The relation between a flood and the damage it may cause to crops is a very complex one.¹

The state as an instrument of class rule which is used by one class to rule over another and at the same time an instrument to organise social labour to work upon the Natural environment, comes into sharp relief in the reshaping of the

relation between the society and the rivers of the Brahmaputra Valley during the late twentieth century. Such interventions by the ruling classes through the organ of the state are necessarily aimed to protect and consolidate its own political and economic interests. The state which represented the class interests of dominant social forces under different social formations, has historically undertaken schemes for transforming Nature. Though the ability to and means of taking up such transformative endeavours was contingent upon the level of development of the productive forces as well as the existing relations of production, almost all such major efforts in a class society has been organised mainly through the state. In the present era, worldwide capitalism in its imperialist form has put enormous resources—material as well as intellectual—at the disposal of ‘private’ individuals and their organisations. As the experience of the last few centuries have shown the world over, the rise of capitalism was distinguished by new forms of exploitation of labour and the plunder of common resources, whereby entire societies have been annihilated, ways of life destroyed, peoples and nations ravaged.

In 1904, the operators of steamers plying on the Brahmaputra between Asom and Bengal reacted sharply to a notification by the Superintendent of Emigration at Calcutta which directed that “dead bodies of emigrants who die on board river steamers should never be thrown overboard but should be either cremated or buried at the nearest landing place.”2 This measure was considered necessary since it was reported by several medical officers in charge of the steamers that they were throwing overboard the bodies of dead passengers and into the river.

The steamer company vehemently protested the new rule, and asked “how impossible it will be for us to run our mail steamers to time under the new rule, and which is a most serious matter to us, seeing that it will involve considerable extra expense to us by reasons of the longer time which will be occupied on the voyage to say nothing of the heavy penalties that will be incurred under the mail

contract, and by the consequent inconvenience to the public by the irregular
delivery of the mails."3 They said, complying with the rule would involve "a large
outlay of staff, fuel, etc. which the labour contractors would have to provide for
burial and cremation, and the Superintendent of Emigration will have to give
notice to all labour contractors and their forwarding agents and set down a scale
as to the number of Domes, and the quantity of fuel for every 100 coolies to be
carried on board each steamer."4 To it was added another argument that corpses
having to be kept on board for some time would pose danger to the health of the
coolies on board the steamers." The operators of the steamer-line demanded that
the state allow the procedure of disposing of dead bodies to be carried out as
usual. This procedure practiced till date was "to have the corpse sewn up in
canvas or a blanket properly weighed with heavy bars of iron or old fine bars,
and consigned to the river midstream, where there is deep water"5

If we locate this anecdotal episode in the history of colonialism in the region, we
will not be surprised to find that the new rule was subsequently annulled by the
state to accommodate the interests of the Brahmaputra's freighters.6 The rules
now redrafted read, "That corpses should be thrown into the river only where
there is good volume of water and where the steam does not set directly towards
a ghat or frequented drinking or bathing place."7 For the state as well as the
British-owned companies it represented had little value of the dead 'coolie' – the
future labourer in Asom's numerous tea gardens that never arrived at his or her
destination. The thousands of tribal villagers imported from central and eastern
India to the plantations who died on the river could simply be consigned to the
waters of the river because ensuring them the privilege of last rites would cut
into the profits of the steamship-owners, the planters and the state. The 'coolies'

3 Ibid.
4 Ibid.
5 Ibid.
6 Telegram from Under Secretary to the Chief Commissioner of Assam, to Messrs. McNeill & Co.,
Agents, Rivers Steam Navigation Company Ltd. Calcutta, No.1223R, Shillong, 10th March 1904,
"Disposal of the Dead Bodies of Coolie who Die on Board the Steamers Plying on the Rivers in
Assam", Rev. A, May 1904, Revenue Department, Assam Secretariat Proceedings, ASA.
7 From the Secretary to the Chief Commissioner of Assam, to Messrs. McNeil & Co., Agents, Rivers
of the Dead Bodies of Coolie who Die on Board the Steamers Plying on the Rivers in Assam", Rev.
A, May 1904, revenue Department, Assam Secretariat Proceedings, ASA.
was cheap and expendable, both in life and in death. The same can be generalised in the context of the Indian state’s approach to the rivers. The concerns related to people’s lives could be forcefully sidelined to make way for upholding the class interests of the ruling power.

The building of multipurpose dams across the world in the twentieth century, particularly in the erstwhile colonies, was a part of the imperialist world economy. The dam industry in the West was going through a geographical reorientation in the second half of the twentieth century as the demand for new dams in the “birthplace” of big dams, i.e., in the U.S. and Europe was reducing, and was increasing in the countries of the ‘Third World’, including India. The U.S. agencies like the Army Corps of Engineers and the Bureau of Reclamation were engaged in the export of their expertise, technology, as well as finance in building big dams and other hydraulic structures to these countries, ostensibly helping out these countries in their “national development”. But as has been pointed out,

Nothing alters the river as totally as a dam. A reservoir is the antithesis of a river—the essence of the river is that it flows, the essence of a reservoir is that it is still. A wild river is dynamic, forever changing—eroding its bed, depositing silt, seeking a new course, bursting its banks, drying up. A dam is monumentally static; it tries to bring a river under control, to regulate its seasonal pattern of floods and low flows. A dam traps sediments and nutrients, alters the river’s temperature and chemistry, and upsets the geological processes of erosion and deposition through which the river sculpts the surrounding land.⁸

This process cannot be understood in isolation from the history of building a network of dams, dykes and irrigation canals outside Europe and North America during the crossroads of the nineteenth and twentieth centuries initiated by British colonialism. It was expected that a regulated regime of year-round supply of water would enable a steady growth of high-value crops such as cotton and

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sugarcane, etc. to be sold profitably in the international market. The Aswan Dams over the Nile in Egypt, and the 'Canal Colonies' of Punjab in India are two glaring monuments of commercial enterprise undertaken by early twentieth century colonialism. In Egypt and India, as also in the American West, the State encouraged consolidated large farms that produced commercial crops. Land regulations and policies of taxation were geared to facilitate the formation and successful functioning of such large-scale agricultural estates. This "great transformation" involved not only the forced eviction of the Egyptian fellah or small peasant and the indigenous population from their ancestral land, but also a fundamental transfer of power of decision-making from marginal communities, in favour of the ruling powers and big agricultural/industrial farm interests. These modern structures, hailed as technological marvels and symbols of man's triumph over Nature, demonstrated that they could also act as means of exercising centralised rule, i.e. the rule of a few over many. They thus represent the contemporary arenas of struggle, of different and opposing class forces in combat, which often underlie a difference of worldviews, life-ways, and imaginations of the present and future society.

The idea of big dams was gaining currency among the Indian ruling classes in the 1950s, and particularly after the beginning of the planned period, even though the history of big dams in South Asia goes back to 1920s when the Mulshi Valley hydro-power dam was constructed near Pune by the Tatas to supply electricity to Bombay industries and amid protests by displaced tribal communities. The

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10 Sanjay Sanghvi, *The River and Life: People’s Struggle in the Narmada Valley*, Mumbai: Earthcare Books, 2000, p.37. Sanghvi, quoting Rajendra Vora’s Marathi book *Mulshi Satyagraha*, wrote, “In 1921, the peasants in the prosperous Mulshi valley near Pune declared total opposition to the hydro-power dam to be built by the Tata Company. The peasants’ organisation in the Maval area in Maharashtra raised concerns about displacement of the farming community, fertile land and well-settled villages. The questioned the claims of benefits of electricity from the dam to the Bombay industries at the cost of destroying agriculture. Leaders of the Mulshi peasants, like Senapati Bapat and Vinayak Bhuskuta confronted the ‘capitalists’ like Tata and vowed to protect the interests of peasants. They challenged the ‘public purpose’, the cost-benefit analysis of the dam, and asserted the priority of social good and the cultural rights of the larger community over the benefits of a few. They continued their opposition with novel methods, despite the fact that Gandhiji did not favour
big dams at that time were portrayed as the motor of economic growth, as the "temples of modern India". A series of big dams were constructed on the major rivers of the country with State investment, as India's big bourgeoisie pushed the state to make investments for infrastructure that involved enormous outlay of capital. These dams were aimed at providing electric power to the needs of the expanding industrial base. Providing irrigation facilities to the monsoon-dependent cultivation was another major objective.

Brahmaputra's Floods and the Regional Ruling Class

In Assam too, the Report of the Flood Enquiry Committee appointed by the provincial government's Public Works Department noted as early as in 1929 that the government was considering "methods of reducing the abnormal flood conditions by means of reservoirs or impounding areas", even though such methods were abandoned at that time as "impracticable." The reshaping of rivers, however, was not entirely new even for the Brahmaputra Valley. At least one river called Bhogdoi in the undivided Sibsagar district and passing along the town of Jorhat was constructed by manually digging up its channel under the initiative of the Ahom State in the medieval period. Under British colonialism, works of such magnitude was scarcely attempted in the Valley, though the trope of "river improvement" was employed while undertaking the "correcting" the natural course of rivers, as was exemplified by the work taken up on the Kalang River in mid-nineteenth century.

During this period the regional ruling classes of the Brahmaputra Valley were also gearing up towards introducing the idea of big dams in the river-system of the region. Construction of dams as a mechanism to provide protection and relief from floods was considered and came up for debate in 1940s. Appropriate measures to "deal with" the Brahmaputra were reflected in the exchanges that took place in the provincial House of Representatives as indicated by a resolution

their stand. In 1924, Bapat declared Atma Samarpan (self-sacrifice) to oppose the dam. This was the first anti-dam people's movement in India..."

placed by one of its members in 1951. The resolution was aimed to mandate the provincial government for approaching the Government of India "to take necessary steps to train or otherwise deal with the river Brahmaputra in order to stop floods which are devastating the state almost every year causing huge loss to the agriculturists." Though this resolution placed in the legislative assembly was withdrawn at the end of the debate, as it failed to muster the support of the ruling Indian National Congress party, it reflected the approach of the regional government towards the floods of the Brahmaputra in the middle of twentieth century. From this point of view, floods of the Brahmaputra and its tributaries were one of the major causes of the Valley's sorrows, the backwardness of its agriculture and the poverty of its peasantry. The rivers had to be controlled if agriculture in Assom was to be salvaged and improved. Broadly, it is this belief that has defined and State's approach and actions related to the rivers in the Brahmaputra Valley in the post-1947 period, to the detriment of both the upper riparian inhabitants on the hills as well as the people in the Valley. This approach was useful in strengthening the material and ideological edifice of the incumbent ruling elite, and until very recently this approach went on almost unchallenged. There is a need to historically outline the introduction and application of the concept of River Control in the Valley, as it has emerged as one of the most powerful tools for the State to control and extract the natural resources of the region. This was accompanied by a powerful ideological justification and defense of River Control, whereby floods in general were depicted as destructive and detrimental to people's livelihood in general and of agriculture in particular. It appeared that the rivers causing recurring destructive floods had to be controlled, regulated and stabilized through big structures and reservoirs.

Beliram Das, the MLA who proposed the above resolution, argued that Assam as a province was never deficit in food grains in the past. The cultivators of the region produced enough for the sustenance of the people, and even could export a part of the food grains to the neighbouring provinces. But in the recent past, he noted, "this surplus state has gradually become a deficit one" so much so that it

had become dependent on other regions for the import of foodstuffs. There was a situation of acute food shortage, which was previously unknown in the region. To him, “successive floods due to the rise in the level of the waters of the Brahmaputra have been the main cause for failure of crops and deficit in our state. The successive floods of the river Brahmaputra washed away crops and the cultivators could not harvest their crops in proper time.”

As a result of the changed bed of the Brahmaputra due to the devastating earthquake, places lying along the banks of the Brahmaputra had been flooded. The strong currents of the river also had a role to play in damaging the crops, as the currents of the River Brahmaputra swept over the standing crops on the paddy or jute fields. Das asserted that “Unless and until proper steps are taken to train or control the waters of the Brahmaputra, we will be having floods every year and consequently we will not be getting crops.”

He pointed out the effectiveness of embankments in protecting agricultural fields, but argued that a comprehensive river training programme needed to be undertaken in order to deliver the peasants of the Valley from their misery. Das admitted that he was aware how great a great task it was to train a river like the Brahmaputra, and the large amount of resources required for such undertaking. But since the prosperity of the whole province was related to the resolution of the flood question, he hoped that the Government of India (GOI) would not hesitate to offer the same.

Comparing Asom with other provinces, he pointed out,

The Government of India have taken up some projects in other states, like the Kosi project, the Damodar Valley or other projects involving crores of rupees. In other states as we have seen, such projects will help in reclamation of land to the extent of at least 3 lakhs acres. But here in Assam if we can train the waters of the Brahmaputra properly then lakhs and lakhs of bighas of land can be protected and the crops of the state can also be saved. So even if this will involve

14 'Resolution regarding to train or otherwise deal with the river Brahmaputra in order to stop floods', Assam Legislative Assembly Debates, August-September 1951, Vol. II, No.15, Shillong: Assam Government Press, 1951, pp.838-847.

15 ibid.
a huge cost of money, the Government of India should see that the state of Assam is saved from the successive floods and loss of their crops every year remedied.16

After the massive earthquake of 1950, the River Brahmaputra had undergone a change in its characteristics, the results of which was the disturbances in its channel and the elevation of its bed. The government argued that "In the changed circumstances, some attempts were made by us to protect waters by constructing bunds in the areas affected by earthquake", but it was soon found out that the bunds were washed away soon after their construction. Therefore, it was stated, that "No protective measure of any permanent nature to train the river Brahmaputra can be made now."17 The impediments to a major river-training project were identified to be the constraints put by financial limitations and lack of expert personnel to carry out the task in addition to the "unstable nature" of the rivers that prevailed in the years after the earthquake.

Haladhar Bhuyan, another member of the Assembly outlined another aspect of the question while taking part in the debate. He argued that more than the natural causes, it was the government's "indiscreet policy" of settling lands along the banks of the Brahmaputra which had accentuated the problem of destructive floods. In the past the banks of the rivers were covered by forests, after these areas were brought under settlement, the forests were also destroyed. Because

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16 'Resolution regarding to train or otherwise deal with the river Brahmaputra in order to stop floods', Assam Legislative Assembly Debates, August-September 1951, Vol. II, No.15, Shillong: Assam Government Press, 1951, pp.838-847.
17 ibid.
The Catchment Area of the Brahmaputra Affected by the Earthquake of 1950
of the forests, flood-water could not pass across them in speed, and thereby acted as buffers between the rivers and the villages inland. Moreover, with a very few man-made impediments on the river’s natural path of drainage in the form of embankments, dykes, etc., floods in general used to remain on the fields only for three to four days’ duration. “This was natural, and since there were miles and miles of forests on the Brahmaputra, floods did not trouble the villages much, and whatever water percolated to the villages was in fact beneficial to the agriculture”, Bhuyan argued.

The government was accused of not weighing the consequences of making land settlements in those forested areas close to the rivers, rather than preserving the protective forest cover on the banks. This, he felt, resulted in the increase in the magnitude of destruction caused by floods in the Valley. For Bhuyan, an effective way of countering the effects of floods was to undertake re-forestation programmes along the banks of the Brahmaputra of at least a quarter-mile width. “The flood water passing through this forest cover will raise the level of the banks, and after a gradual gain of height the spilling of the bank would be stopped completely”, Bhuyan suggested. According to him, only after this step must any other measure for river control needed to be considered for implementation, not to substitute but to supplement this work. The efficacy and benefits of embankments as a measure of flood control too came under question and criticism in the debate. As J. S. Hardman, a member of the house noted,

It has been accepted that the bunding of the Brahmaputra will be too expensive to execute as a whole. But what is the effect of bunding a portion of the river? It means that we give immunity to particular areas and submerge the remaining areas far deeper than they would otherwise have been flooded. In many places throughout India bunding has been carried out and I believe it is the accepted expert opinion today that unless there are important towns to be protected, it

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18 ibid.
'Lohit River below Rima being Filled Up with Sand'

'Dibang Valley: Forest Stripped from Hillsides in Earthquake'
inexpedient to try and artificially control a river in this manner as the benefit of one area becomes the misfortune for another. It may be urged that flooding of the Brahmaputra is an inevitable misfortune which we cannot avoid.\textsuperscript{19}

In spite of the reservations about embankments as an appropriate flood control measure, the provincial government advocated and constructed them with fervor during the second half of the nineteenth century. These flood control structures came up in great succession and all across the Valley from 1950s onwards, particularly after the destructive floods of 1954. One of the reasons and justifications of these works were the devastating floods that occurred at regular intervals during this period, particularly in the years 1954, 1962, 1972, 1977, 1984, 1988, 1998, 2002, 2004 and 2007.\textsuperscript{20} Apart from floods, nearly 400,000 hectares of land has been estimated to be eroded by the rivers in the Valley between 1954 and 1986, rendering more than 90,000 families homeless.\textsuperscript{21}

It may be worth mentioning here that works of great magnitudes pertaining to flood-protection were taken up by the State in the Brahmaputra Valley in two periods. The first period of intensive work was carried out under the aegis of the Ahom and Koch States in the 15\textsuperscript{th} to 17\textsuperscript{th} century, while the second period corresponds to the second half of twentieth century. During the colonial regime, only a few major works related to flood-protection was taken up by the State, leaving it to the peasants and private individuals to protect their fields and property with their own contributions of money and labour in constructing embankments.

\textsuperscript{19} Speech by J. S. Hardman, 'Resolution regarding to train or otherwise deal with the river Brahmaputra in order to stop floods', \textit{Assam Legislative Assembly Debates}, August-September 1951, Vol. II, No.15, Shillong: Assam Government Press, 1951, pp.838-847.

\textsuperscript{20} ibid.

\textsuperscript{21} ibid.
From Flood Control to River Control

It is a generally accepted that the great earthquake that shook the region in 1950, which was even higher in intensity than that of 1897, greatly altered its topography and river-regime. It has been said that as a result of this, floods have not only become more frequent but also brought more devastation and misery to the people of the Valley. As an official report prepared a few years after the earthquake noted, “Situated between the eastern Himalayas and the Indo-Burmese Range, Assam which covers the area of the heaviest rainfall in the world used to have periodical floods in the past. These floods used to occur at intervals of a few years so that people had some respite in between these periodic attacks. But floods have become an annual visitant since the Great Earthquake of 1950, which has severely disturbed the riverine system. Unlike in the past, more than one flood now occur in the course of the same year.”  

Similarly, another Assam government report from the same period stated, “Since the Great Earthquake of 1950, flood has become a common phenomenon in the State of Assam.” It was found that due to the earthquake the course of several rivers underwent changes and the beds of the rivers in the region had become shallow due to deposit of silt brought down from the hills devastated by landslides. Such rivers then lose the carrying capacity of water during the monsoons, and even a small rise in the water level can result in the river waters spilling over their banks and damaging the outlying fields and habitations. “This has resulted in the occurrence of flood with a distressing frequency, every year, during the rains.”

It is also known that a typical alluvial river as described above cannot maintain a channel section which is capable of carrying the flood discharge within its formed banks. This is particularly true where the rainfall is concentrated within the monsoon months, where the maximum intensity of rainfall in relation to average rainfall is large and the silt charge during a high flood in the river is high. All these conditions apply in case of the Assam rivers. The position being as

24 ibid., p. 1.
described above, floods in Assam even in pre-earthquake times were frequent and damaging. Since the earthquake of 1950 however conditions appear to be progressively worsening.25

The rivers frequently changing their course, particularly in the North bank of the Brahmaputra, were also identified as another factor that caused flooding in their respective valleys. “Any spill channel that may form during a high flood by scouring out the river bank goes on developing and the deeper drainage channel draining the adjacent valley cuts back through gully erosion to catch up the river through the spill channel and the river changes its entire course into the adjacent drainage channel creating new flood problems in the valley.”26 Such a phenomenon was noticeable in case of the rivers such as Champamati, Pagladiya, Mutonga, Sukla, Brahmajan, Dhansiri and Jiadhol, all tributaries of the Brahmaputra. Moreover, “Choking of river channels resulting in inundation of extensive areas in their basins is another phenomenon which is prevalent in a number of cases. This happened occasionally prior to the earthquake but has been very common in north-eastern Assam after the earthquake.” For instance, Singara, Kakoi, Dirgha, Jiadhol, Sissi, Balijan, Dibru, Kulsi and Noa Dehing rivers had their channels blocked for natural reasons, making the water they carried to spill over their banks and inundating the adjoining areas. There were other important factors causing the devastating floods. “It is a known fact that the dry weather flow of all rivers has diminished appreciably within living memory. Correspondingly the flood discharge during the monsoon months have increased. Progressive opening up of unclassed forest areas and grass land in the submontane areas for cultivation must have contributed its share to this. How far deforestation in the hills and jhumming are responsible for increased flood discharge is a matter of detailed study.”27 Added to the above factors was the effect of railway and road embankments on the natural drainage of rivers in the

26 ibid.
27 ibid.
both banks of the Valley, which held up the flood-water in many areas causing local inundations and aggravated the flood damage to crops in those areas. 28

The combined affects of the natural and social factors leading to destructive floods were severely felt in the summer of 1954. It was said that in that year floods exceeded all past records with three major floods in quick succession within three months, each higher than the last. The first major flood occurred in the middle of June 1954, damaging the aus paddy and jute crops. This flood subsided by the end of June when the second and even higher flood occurred in the beginning of July 1954, resulting in the complete destruction of the few remaining patches of aus and jute in the flooded areas. “Deprived of their aus paddy and jute crops the people were hoping to grow more Sali paddy for their subsistence after the subsidence of the flood.” Subsequently, the third and severest of the three floods occurred on the 24 August 1954. The level of this flood crossed the highest recorded flooded-level of 1931 in several places on the Brahmaputra. It was said that this latest wave “completed the destruction of whatever property the unfortunate people had left after the two earlier floods and rendered them totally destitute.” 29

In this series of floods in 1954, major parts of the districts of Lakhimpur, Sibsagar, Darrang, Nowgong, Kamrup and Goalpara covering an area of over 12,000 sq. miles were inundated. According to the official statistics, the floods badly affected 255,873 families consisting approximately of 1,279,365 persons. In addition, 7,500 families with approximately 37,500 persons lost their homesteads and cultivable lands due to erosion. Loss of human life due to the floods was estimated to be seventeen. Approximately 65 percent of the total aus paddy and 53 percent of the total jute produced in the province were destroyed. 30 Moreover, a considerable proportion of the sali crop was lost either because seedlings were destroyed or transplantation could not be carried out due to the third flood. Apart from the proposals of building additional flood-

30 ibid.
protection works, the government admitted that "The agriculturalists living in the rural areas will be provided with homestead lands and agricultural lands for cultivation as well as house building advances and subsistence grants." Another important aspect of the varied impact of floods was also brought out in the report, which noted that "About one third of the affected families belong to the scheduled castes and scheduled tribes who will not be able to repay if the entire amount is given as a loan." 31

The floods of 1954 also resulted in massive erosion of the inhabited and cultivated banks of the rivers. As has been noted, "a large number of families have been more or less affected by erosion and in some places houses and properties have also been washed away. The river Aie, as in the last year, in the district of Goalpara was also in high flood and washed away about 400 bighas." 32 The official figures of cattle lost stood at above three thousand, while the area eroded was reported to be 17,617 acres, 354 villages and 7,791 families were affected by erosion. 33

The immediate response of the provincial government in the aftermath of the series of floods in 1954 was the construction of earthen dykes and embankments along the Brahmaputra and its tributaries. Flood control measures carried out in the winter season of 1954-55 included 125 miles of dykes on the Brahmaputra in the districts of Goalpara, Kamrup, Darrang, Sibsagar and Lakhimpur, over 400 miles of tributary dykes in Kamrup, Nowgong, Darrang, Sibsagar, Lakhimpur and Cachar districts, Dibrugarh town protection works against erosion, and so on. 34

The provincial legislature replaced the Assam Embankment and Drainage Act of 1941 with the Assam Embankment and Drainage Act, 1953 (Assam Act of I of 1954), as the former was seen as an impediment to expeditiously implementing embankment, irrigation and drainage works in connection with flood protection.

31 ibid. Emphasis added.
33 ibid.
The Act of 1941 required the preparation in advance of detailed schedules and contour surveys as well as the assessment of the possible benefits of such works. However, this provision was dispensed with in the new Act with the plea that it "generally entails elaborate process involving time factor". The government argued that "due to the emergent situation created by the great earthquake of 1950 and subsequent high floods of 1952 and 1954, certain embankment and irrigation works had to be taken up urgently without strictly and meticulously following the provisions of the Act [of 1941]". In the name of simplification, urgency and immediacy of implementing such works, all avenues were now opened for undertaking rapid construction of flood protection works, primarily through embankments, admittedly without subjecting these projects to scientific study, planning and execution. Moreover, through another provision of this Act, the government acquired the power to levy "water rate or betterment cess" with retrospective effect from the people of the region where a government project for drainage, irrigation, or flood protection was or was to be carried out.

It was proposed that in the season of 1955-56, more than a hundred miles of Brahmaputra dykes and 242 miles of new dykes on its tributaries were to be constructed. While as per the approach of the government embankments provided a ready solution for protecting the villages and towns along the rivers and in their floodplains, the resettlement of destroyed villages also posed a big challenge for the provincial government.

The rehabilitation of the uprooted families due to flood and erosion is an uphill task though an important one, due to non-availability of waste lands for rehabilitation and this has become a headache to Government. For this purpose huge amounts will also be required both as rehabilitation loan and grant. The exact amounts that will be required for rehabilitation purposes could not be

36 ibid.
determined yet as both homestead and cultivable lands will also have to be purchased or acquired from private concerns for the affected families where Government land will not be available... a considerable amount of land revenue and local rate will have to be remitted for those people who have lost their crops.\footnote{Note on the Damage Caused by Flood and Erosion in Assam during 1955-56 and Relief Measures Undertaken or Proposed, Shillong: Assam Government Press, 1956, p.1.}

The priority of the government in the following decades to counter the annual floods by constructing more and more earthen embankments is reflected in the 'capital outlay' of the Flood Control and Irrigation Wing of the Public Works Department. In the financial year 1962-63, the single-largest head of expenditure was 'Flood Control' primarily through embankments for which out of a total budget of Rs.156 lakhs, nearly a half or Rs.70 lakh was earmarked.\footnote{‘Detailed Estimate of Revenue and Expenditure for the Year 1962-63’, Assam Public Works Department, Flood Control and Irrigation Wing, Gauhati: Assam Government Press, 1963.} Similarly, out of a total capital outlay of Rs.4.32 crores for the Flood Control and Irrigation Department under the fourth Five Year Plan in 1966-67, Rs.3.15 crores were set aside for embankment and drainage work intended for flood-control, while the remaining Rs.1.7 crore was spent on medium and small irrigation projects.\footnote{‘Detailed Estimate of Revenue and Expenditure for the Year 1966-67’, Assam Public Works Department, Flood Control and Irrigation Wing, Gauhati: Assam Government Press, 1967.}

As reported by one government document, the works executed up to March 1985 in the Brahmaputra and Barak Valleys included construction of 3,433 kilometers of embankments, 494 kilometers of drainage channels, protection work of 35 towns and 90 villages and construction of 391 sluices in the embankments. As per government estimates, these flood control works provided protection to an area of nearly 13.27 lakh hectares out of a flood prone area of about 19 lakh hectares in Brahmaputra Valley.\footnote{Master Plan of Brahmaputra Basin, Part I, Main Stem, Brahmaputra Board, Government of India, Ministry of Water Resources, 1986, p.14.} This process of building embankments continued in the succeeding period, and another thousand kilometers were added in the next twenty years. By the first decade of the twenty-first century, Assom had 4,446 kilometers of embankments of which 3,750 kilometers were in the Brahmaputra Valley, 854.19 kilometers of drainage channels, 86 big sluices
and 694 anti-erosion structures.\textsuperscript{42} Of these, a major portion was constructed along the northern and southern banks of the Brahmaputra totaling a length of 934 kilometers as of 1985.\textsuperscript{43} It was however admitted that “Construction of embankments accentuate drainage problem in the countryside.” Therefore, to mitigate it, 494 kilometers of drainage channel and 391 drainage sluices were constructed. “Channel improvement” through drainage and dredging of the river bed was attempted on the Brahmaputra downstream. However, it proved to be an expensive exercise and did not yield the desired results.\textsuperscript{44}

In addition to the protection of the countryside and the cultivated fields, another concern for the government was to safeguard the townships on the banks of the Brahmaputra from the floods, and particularly from the danger of obliteration caused by erosion after 1950. One of the most important towns said to be on the verge of extinction was Dibrugarh in the undivided Sibsagar district, though large scale erosion was not unknown in the region. As E. A. Peal observed way back in 1870, “During a sudden rise lately at the end of this year, several thousand acres of land were carried away near Dibroogur alone, and the steamer ghat suddenly taken 3 miles nearer the station.”\textsuperscript{45} After the Indian government decided to accept the measures recommended by the Iengar Committee for the protection of the Dibrugarh town against erosion of the Brahmaputra, the provincial government passed ‘The Assam Betterment Fee and mooring Tax (Dibrugarh) Act 1953’. One of the recommendations of the Iengar Committee was to construct a four mile long stone revetment along the southern bank of the Brahmaputra adjacent to the town as a flood protection work. According to the Act, the definition of ‘Flood Protection Work’ is to encompass any spur, embankment, revetment, or drainage work or such construction for the protection of the Dibrugarh town from the erosion and floods of the Brahmaputra. The condition of financing the project was that while the central government was to provide a grant covering half the cost, the other half was to

\textsuperscript{42}‘Assam’s Sorrow’, \textit{Frontline}, Vol. 25 (20), September 27 to October 10, 2008.

\textsuperscript{43}“These are not continuous, but have constructed only in flood prone reaches”. \textit{Master Plan of Brahmaputra Basin, Part I, Main Stem}, Brahmaputra Board, Government of India, Ministry of Water Resources, 1986, p.139.

\textsuperscript{44}ibid., p.139.

be given to the provincial government as interest-free loan, to be collected through an annual levy for twenty years from the project's 'beneficiaries'. Empowering itself with the Act, the government not only proceeded to collect the charge from the town's inhabitants, but also levied "a mooring tax from steamers or flats mooring within 400 yards of the revetment". In one of the early instances of making the 'public' in the Valley directly pay in the name of 'Betterment Fee' for the 'public works', the government went on to specify four areas or 'belts' parallel to the river, the inhabitants of which were liable to pay the above levy. As per the Act, "All areas within any of the belts shall be deemed to be benefited irrespective of the nature and quantum of the actual benefits accruing to any particular plot of land." 

In spite of the awareness that the embankments and other "flood protection works" were not carried out as per well thought out plans and after adequate studies, the provincial government was keen to continue their construction. Though it advocated the possibility and the necessity of the big dams as a means to put a check on the annual floods, the government's opinion was that "a large scale control of Assam's rivers through methods such as construction of dams, etc., may, of necessity, be a somewhat long drawn out process, despite the priority that may be accorded to it by the state and central governments. Meanwhile, something has to be done to arrest the increasing inundation by the Assam's rivers in general and by Brahmaputra in particular." Similarly, the government's opinion was that "While the construction of dams has, of necessity to await collection of data and detailed investigations and reports by geologists, etc., the work on the dyke along side the Brahmaputra can be taken up relatively quickly." The provincial government hoped that this pragmatic, ad-hoc and unplanned approach at building flood protection and anti-erosion structures was in the future was to lead to fully embanked rivers that run along their entire

48 "the state government are carrying out embankment and drainage measures all over the state. This, however, have not been so far carried out in a very consolidated and coordinated manner." ibid.
49 ibid.
course in the valley, and this was to supplement the dams that would be constructed upstream. As the government argued,

It appears to the state engineers that both as an immediate measure of relief and also to supplement the river control measures to be taken up by way of construction of dams, etc., embankment projects need to be up so as to have running embankments along the full course of the problem rivers including the Brahmaputra, on both banks. The embankments will run from a point in the foothills to the confluence with a bigger river or to a point on the borders of the state as the case may be. Considerable stretches of embankment already exist. The programme suggested envisages completion in the remaining low-lying stretches, after proper survey, and strengthening of the existing bunds wherever necessary. 50

The argument that recurring floods are responsible for the dismal agricultural productivity in the region continued to be articulated in government's documents and official discourse, as is the case with the provincial government's memorandum to the agriculture minister of GOI in 1975. It stated, "Whatever is being done to spread the cultivation of High Yielding Varieties, with improved practices, the fact remains that both the autumn and winter paddy crops remain subject to the vagaries of the floods. The aim has been to change the old cropping pattern so as to bring substantial acreage under crop which is cultivated in the flood free season. With the help of the irrigation department, who are taking up a big programme in the chronically flood affected areas, which is about 12% of the net cropped area, this change in cropping pattern is sought to be brought about. 51 The Kharif (sali) paddy covers 67% of the paddy area and 60% of the total cultivable area while Rabi (ahu) paddy covers 28% of the paddy area and 24% of the total cultivable area in 1974-75. 52

While the 'immediate' and 'short term' tasks of building embankments was thus taken up primarily by provincial government, the building of mega dams and

50 ibid.
51 'A Note on position of Irrigation in the Context of Emergency', 1975', 9 August 1975, ASA.
52 ibid.
structures on the streams were left to the Indian bureaucratic capital through the interventions of the GOI. This arrangement and division of work served the interests of both the regional as well as the Indian ruling class. Through works of flood protection and mitigation it was expected on one hand that marginal embankments properly planned and constructed would control inundation to a great extent. This was in spite of the fact that the suitability of constructing embankments, and later of reservoirs, was contested from within the scientific and technical establishment of the state. As has been noted in the Master Plan for the Brahmaputra, "Opinions have differed from state to state and from time to time in the twenties and thirties of the present century regarding effectiveness of embankment as a flood control measure. Opinion in Assam like other flood prone states in the country was against the construction of embankments, but gradually it veered round in its favour, particularly after 1954 when the National Flood Control Policy was formulated by the GOI for a programme in three phases, viz. the immediate, the short and the long term."

On the other hand, the construction of "flood detention reservoirs" in the upper reaches of the principal rivers and their tributaries of the Valley was to "go a long way to mitigate the disastrous effects of the floods in the valleys and lower reaches by holding up, for gradual release, very substantial quantities of flood discharge." Improvement of navigation in the rivers was also envisaged as a beneficial outcome of dams, enabling the controlled release of water during the dry months of the year when the rivers were too shallow and inadequate for water transport.

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53 ibid.
54 ibid.
Big Dams as the ‘Solution’

The disastrous floods of 1954 and the tragedy and sufferings that followed in the wake of these floods pointed to the need for tackling the flood problem on the basis of national emergency. The Union Minister for Planning and Irrigation and Power placed before the Parliament, on 3 September 1954, two statements regarding ‘Floods in India: Problems and Remedies’ and the ‘Floods in the Country’. These statements brought out for the first time the national policy regarding the problems of floods and their remedies in a comprehensive manner.

The Brahmaputra, one of the largest rivers of the world, has been a problem river for long. Flowing through the narrow valley of Assam, it has been causing great damage, year after year, by flooding vast areas, eroding away valuable land, and creating drainage congestion. Yet with its abundant water resources, the river has the capacity of bestowing enormous benefits, particularly of hydropower, irrigation, and navigation. So far only a fringe of these benefits has been secured. 55

After 1947, Indian bureaucratic capital in the North East was looking for newer avenues of investment, primarily through the exploitation of the hitherto untapped natural resources. Petroleum was already a major sector of investment for companies with British financial investment, which was up and running from the beginning of the twentieth century. From 1947 itself, the regional ruling class was looking up to the assistance of the central government to mitigate the effects of the Brahmaputra floods and erosion. As one of its reports noted,

As regards short and long term measures for control of floods in the state of Assam, these are, in any case, beyond the resources of the state. Some preliminary measures which are to be taken by the state govt. are being financed from the state's resources for the time being, but it is hoped that the central govt. will take a direct hand in the solution of the flood problem of the state... This, in the given circumstances, would imply that the central govt. should by and large meet the overall expenditure on flood control. 56

After the high floods in the Brahmaputra and its two tributaries Dehing and the Kopilli in 1946, the state government requested the Central Water and Inland Navigation Commission (CWINC) of the Government of India (GOI) to suggest

56 Note on the Damage Caused by Flood and Erosion in Assam during 1955-56 and Relief Measures Undertaken or Proposed, Shillong: Assam Government Press, 1956. The following section is based on this document.
"the best way how to tackle the flood problems of the Kopilli in particular and of Assam in general." In response, S. C. Majumdar and Man Singh, members of CWINC and Central Water and Power Commission (CWPC) respectively, were sent to Assam in May 1947. After touring the Brahmaputra Valley and discussing with local officers, these experts made a series of recommendations for the short term and long term preventive measures. In the short term, they suggested the provision of adequate openings and aqueducts in the existing railway and road embankments as well as "improvement of spill and drainage channels" in the valley in order to reduce and minimize the obstructions to the natural course of the floods. Along with improvement of the catchment area of the major rivers through systematic afforestation and gradual substitution of jhum cultivation with terrace cultivation, the experts recommended as long term measures the establishment of a River Commission to coordinate and carry out scientific studies and systematic data collection which would lead up to the "[C]onstruction of flood detention multi-purpose dams."

In October 1947 Man Singh, the expert sent by the GOI, came back to the valley for another visit. After a study of maps and discussions with local officers, the team came to the conclusion that almost all the tributaries of the Brahmaputra and the Barak rivers "could be developed for multipurpose schemes of flood control, hydro power, navigation and to some extent, irrigation." The team recommended conducting preliminary investigation to the following projects for multipurpose dams. The first priority was given to the construction of a 500 feet dam across the Dihang River, a major tributary of the Brahmaputra, which would have an installed capacity to produce 2 million kilowatts of electricity. As the second priority, a 480 feet high dam across the Barak was recommended, generating electricity of 1.5 million kilowatts. A 400 feet high dam across the Manas River in the Brahmaputra valley was third in the priority list, with an estimated capacity of 1.25 million kilowatts. Lastly, a dam across the Subansiri was suggested, which could generate 90,000 kilowatts once completed.

57 ibid.
An ad-hoc committee constituted by a group of engineers with the government of India reviewed these proposals in May 1948, and came to the conclusion that in view of shortage of trained personnel and necessary equipments, the rivers Manas and the Dihang alone would initially be taken up for investigation. The Central Water and Power Commission (CWPC) of the GOI undertook preliminary investigations for the two rivers and established a Division for the purpose. The investigations, however, were cut short by the earthquake of 1950, since extensive landslides occurred in the Dihang catchment area which choked the river gorge temporarily and silted up the river bed. The investigation of the Manas River in addition faced another hindrance in the form of Bhutan government’s inability to provide the “necessary facilities”. As such, only “routine hydrological data” were collected for the two rivers. Significantly, the Geological Survey of India at the same period came up with an objection to the construction of dams on the Dihang “due to the instability of the regime.”

In April 1953, Man Singh, the member of the CWPC once again visited Asom and made aerial surveys of the Jia Bhorali and Subansiri rivers. Man Singh was “favourably impressed” with the possibilities of building dams on both these rivers “for better control of floods and generation of hydro power.” But the problem of scientific studies and inadequate data hindered any concrete planning. This problem was also highlighted by the Ienger Committee constituted by the GOI which visited the province in early 1950s to “study its problems”, including the question of floods. It was therefore noted in 1954 that “The Committee was struck by the paucity of data on which river valley control may be planned. They therefore recommended that a River Investigation Division should be set up under the CWPC to collect the necessary data for planning of river control.”

In November 1953, in a meeting held in New Delhi where the agencies of the central as well as the provincial government participated, it was decided to first conduct preliminary studies so that the data necessary for any feasibility

59 ibid.
assessment could be generated, and thereafter to prepare reports on the possibility of building dams. The following rivers were taken up for study in an order of priority: first, the Kopilli valley comprising of three dams- Kopilli, Diyung and Barpani; second, Pagladiya; third, Subansiri; fourth, Jhanzi; and fifth, Buri Dehing. It was stated that the first three projects were meant primarily for flood control, while the fourth would mainly be for power generation, and the fifth would be a multipurpose dam for flood control, power and navigation.

Though in view of the above considerations, the preliminary data relating to these rivers were collected in the 1950s, which included “data regarding flood protection, irrigation and power needs, etc., along side with data relating to the areas which could be reclaimed by control of rivers, financial loss accruing to government as a result of floods, potential revenue that might accrue to government as a result of reclamation”, there was hardly any corresponding data related to a few other major north bank tributaries of Brahmaputra, i.e., the Dibang, Dehang and Lohit. One of the reasons for this lack of investigation was that the provincial government till the mid1950s was quite unsure as to whether “control projects in relation to these rivers” could at all be taken up given the geological instability and high seismicity of the region, along with the magnitude of the work involved, which was beyond its means. However, it was soon proclaimed by the government that “the North-Eastern rivers, viz., Dibang, Dehang and Lohit, etc. are the rivers which in the main are responsible for the Brahmaputra floods along with other north bank tributaries of the Brahmaputra.” The government therefore came up with the opinion that North Eastern rivers, [therefore,] require to be studied with a great deal of urgency from the point of view of flood control, despite the geological and other factors which might be against them. It seems to the state government that it is imperative to do something for the control of these rivers if heavy devastation by the Brahmaputra along its entire course has to be avoided. Control of the Lohit will avoid the periodical inundation and disruptions of the railway system between Doom Dooma and Saikhowaghat and the National Highway as well. It is even felt that to restrict expenditure, control of these rivers may be taken up for the time being only from the flood control point of view, leaving other aspects of
multipurpose development such as hydro-power, etc., to be tackled in due course. The state government feel that examination and control of the north-eastern rivers is a problem which should be given priority 'One' by the government of India's experts.  

After examination of the available data, CWPC was subsequently asked to prepare reports on the feasibility of building reservoirs on four rivers: the Kopili, Barak, Subansiri and Noa Dehing. The Geological Survey of India was at the same time to be consulted regarding the viability of big dams on the Dibang, Lohit and Jia Bhorali rivers, "so that the further steps may be taken to evolve priorities for river control measures."

The provincial government expressed its keenness to build up adequate technical expertise and mechanism in Asom for collection of data, experimentation and drawing up of short and long term schemes for "river control." One of the initial steps was the formation of River Investigation Divisions, which was later brought under the River Investigation Circle for the region. However, the provincial government was not only dependent on the GOI for providing the financial resources for running these institutional mechanisms for collection of scientific data and for planning, but it was expected that "The central government will also have to assist the state government in finding necessary technical personnel to the extent required for the River Investigation Circle." The provincial government admitted that it was extremely short of technical personnel for its needs in the spheres "other than river control, and in the sphere of river control there are not many personnel with the requisite training and experience." Therefore it assumed that the "whole work of river control" out of necessity was to be carried out under the guidance and supervision of the technical experts of the CWPC. The provincial government of Asom was of the expectation that the "central government's engineers should give their advice on this suggestion of running embankments envisaged to give

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61 ibid.
immediate and at least partial control of problem rivers, after studying if necessary, the experience of such embankments in other countries also."62

Given that the 'problem' at hand appeared to the provincial government to be a "very gigantic one which has to be tackled very largely with central assistance both technical and financial", the institutional mechanisms to "deal with the problem" were also envisaged in a way in which the GOI would play the primary role. So the suggested constituents of the proposed Assam Rivers Commission included the CWPC, Planning Commission, Ministry of Finance, Railway Board along with the provincial government. As for the Commission,

This commission should be made responsible for overall direction of investigation relating to the flood problem, conducting the experiments for control, preparation of short and long term schemes for solution of the flood problem, and for ensuring prompt and effective implementation on an emergency basis. The reasons for representation of the CWPC, the Planning Commission and the finance ministry are obvious, inasmuch as the state requires to the fullest possible extent, the technical and financial assistance of the government of India. The reasons for the representation of the railway board is that without proper coordination of the railway embankments and openings for waste discharge, etc., with the river control measures to be taken up in the state, the full benefits of the latter will not be achieved.63

Till the floods of 1954, the Public Works Department under the provincial government was the agency which carried out the flood protection works even though its main tasks included the construction of "buildings, roads and bridges". It was not a department which had specialized expertise on flood control: "Flood control received less attention and the Department did not develop the expertise necessary for handling the problems of a very large river of the size of the Brahmaputra."64 However, the high floods that year led to the establishment of a separate department of flood control and irrigation within the provincial

62 ibid.
63 ibid.
64 Master Plan of Brahmaputra Basin, Part I, Main Stem, Brahmaputra Board, Government of India, Ministry of Water Resources, 1986
government, which was to be the specialized nodal body for carrying out flood control and relief measures in the valley as far as the short term tasks were concerned. Later in 1970, a three tier technical set-up for giving the department “high level policy guidance” through consultation was put in place. This consultative mechanism involved the Brahmaputra Flood Control Board (BFCB), the Brahmaputra Flood Control Commission (BFCC), and the Board of Technical Consultants. “The Brahmaputra Flood Control Commission was a whole time organization constituted by the government of Assam on the advice of the GOI to work within the broad framework of policy directions issued by BFCB. The Board of Technical Consultants was chaired by an eminent engineer, the members being the heads of the service organisations like CWC, IMD, GSI, a professor of the Assam Engineering College, Director of Soil Conservation, Assam and members of the BFCC.” Among these organisations, the BFCB was formed as a high powered policy-making body to decide priorities in the implementation of the planned flood-control schemes, in sanctioning estimates and approving allocation of funds.

These official bodies were in a decade to become the cornerstone for establishing the Brahmaputra Board under the control of the GOI. But even before these institutions came up, the GOI was actively considering the ‘long term’ measures such as the multipurpose dams during the three decades that followed till the establishment of the Brahmaputra Board. A series of central government’s committees studied the “flood problem” in the region in this period, which included the High Level Committee on Floods in 1957, Minister’s Committee on Flood Control in 1964, Minister’s Committee on Flood and Flood Relief in 1972, Study Group for the Erosion Problems of the Brahmaputra in 1964, and Committee on Scientific Flood Forecasting in the Country.

Though the construction of big dams in the region was actively considered and recommended by the committees and study groups that discussed the question of floods, apart from the immediate and ‘short term’ measures at flood control, no big project was taken up immediately. More than three decades elapsed for

65 ibid.
flood control to enter the phase of river control, a transition that was most vividly marked by the formation of the Brahmaputra Board by an act of the Parliament in September 1980. As the Board’s publication notes, “Nearly three decades have elapsed since the immediate phase, as visualized in 1954, was over. The short term phase comprising flood control measures such as construction of embankments, channel improvements and protection of towns is continuing since Second plan.” According to the administrators and experts of the Board, “These works now require to be stabilized.” With the coming of the Board, the Brahmaputra Flood Control Board (BFCB) constituted by the GOI in May 1970 was dissolved with effect from March 1982. The provincial government too formed a Technical Advisory Committee to replace the Board of Technical Consultants (BTC).

**Imperial Science and Bureaucratic Capital: Laying Down the Foundations**

The GOI was at the same time keen on assessing the ways in which various countries in the world ‘developed’ their rivers and their “water resources”, apart from the means of mitigating the effects of flood and erosion. It constituted a ‘Study Group’ to investigate the problem of erosion on the Brahmaputra in 1964. “In its report submitted in 1965, the study group dealt with the nature and extent of the erosion problem, its cause, and measures adopted in other countries.” It was not only the state-scientists and experts affiliated to the central government and its agencies that were involved in the enquiry of the question of “dealing with the problem”. A series of experts from U.S.A. and Europe visited Assom and studied the region’s river system, and came up with recommendations in the decades following the floods of 1954.

B. P. Bellport, the Chief Engineer of the U.S. Bureau of Reclamation and Dr. Ian Barton of the U.S. Army Corps of Engineers visited the region separately in 1965. Bellport recommended in his report that reconnaissance studies needed to be carried out to determine the magnitude of the ‘problem’ of floods, as well as to

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66 ibid.
understand not only the hydrological but also the economic features of the Brahmaputra basin. In his opinion, "The survey should include not only the survey of water resources, but also an effort to determine the feasibility of constructing dams on the tributary streams."\textsuperscript{67}

Though Dr. Ian Barton recommended construction of big dams in the region, he was of the opinion that it could not be 'justified' only for the purpose of flood control. Rather, this has to be an ancillary benefit, whereas generation of electricity had to be one of the primary aims. He suggested that the "Problem of earthquake and large silt charge in the rivers will have to be taken into account in the design of multipurpose schemes. This silt load in the rivers can be reduced by taking up proper watershed management." In 1966, after a year of Barton's visit, another expert from the U.S. Army Corps of Engineers H. E. Weller made a detailed study of the Brahmaputra. Weller's report gave a glimpse of the things to come.

In his report he suggested that the most desirable plan for controlling of Brahmaputra River is complete stabilization. To accomplish this, sufficient reservoirs to reduce input of sediment and halt of aggrading tendency of the river, should be constructed. The river could then be confined into a single channel trained into a series easy bends, preferably along the main channel by all methods of channel stabilization. It requires a vast outlay of money, tremendous amount of manpower, equipments and materials. Further, the limited number of reservoir sites may not provide a sufficient reduction of sediment load. Confinement of the river in a single channel might well raise flood heights which will require higher embankments. Such complete stabilization is not feasible at present, and, therefore, work in specified locations will have to be considered. He also observed that dredging judiciously applied can, in many cases, divert the river away from the problem area. A careful study of river trend is, however, necessary for this type of work, he opined.\textsuperscript{68}

\textsuperscript{67} ibid.

\textsuperscript{68} ibid.
In 1963, the National Hydraulic Laboratory (N.H.L.), Chatou of France was roped in by the GOI to study the feasibility and means for the improvement of the navigability and protection of the Brahmaputra's river banks. This study was conducted in collaboration with the United Nations Economics Commission for Asia and Far East under the guidance of Maurice Remillieux, the Chief Engineer of NHL. Experiments with five trials were taken up from 1963 to 1970 for improving the navigability of the Brahmaputra and for its bank protection. The experiments were found to be successful in three places while they failed in two places. With these results, it was held to be impossible to go further with the 'river-training' project for the Brahmaputra without a suitable and systematic long-term programme to study the evolution of its 'channel-processes'.

The same set of questions was also studied by W. A. Stufft of the United States Aid for International Development (USAID) in 1970. His recommendation to the GOI was that the Brahmaputra Flood Control Commission (BFCC) was to be entrusted with the task of preparing a "framework plan" primarily for mitigating floods and bank erosion as well as for improvement of the drainage in the valley. He suggested that "The function of irrigation, power, navigation, soil conservation, water supply, fisheries should also be considered where they are directly related to the primary purpose." For preparing this plan, not only the services of engineers specialized in hydrology and sedimentation needed to be mobilised, according to Stufft, but also that of an economist who would undertake a thorough cost-benefit analysis of the planned projects. Stufft laid out the following tasks in order to control the river system of Brahmaputra:

Immediate: To complete construction of embankments and construction of bank protection at some selected localities where town or other important structures are threatened. Short term: To prepare a framework for flood control to determine if a system of reservoirs will be feasible. Long term: To make detailed investigation aimed towards multipurpose developments of the basin through construction of reservoirs at suitable sites. In addition, they suggested that the

69 ibid.
For the experts and the state-scientists, the natural structure of the river Brahmaputra was inherently faulty. "As the slope in its valley in Assam is much steeper than required for a poised river of its size, the Brahmaputra, burdened with heavy silt load, flows listlessly through the valley attacking its banks as if it has been provoked. This has been the mood of the river since ages and during this period it has eaten away so much fertile land in the valley that now it has a bed width of 6 to 19 km to wriggle in. Swollen during the Monsoon period, it spills its banks flooding vast areas and obstructing drainage." However, such a source of agony could be turned into its opposite: as a source of benefit. As the Master Plan notes, "Yet with a propensity to inflict enormous damage it has the capacity to bestow large benefits in the shape of hydropower, navigation and irrigation. These have to be secured in a plausible manner." Floods and erosion caused enormous financial loss, both from its direct and indirect effects, the document argued. "the loss damage statistics are being collected in the country since 1954... there is considerable indirect loss due to disruption of rail and road communication, lower crop production and extra expenditure on relief and rehabilitation, etc. if indirect loss is taken into account, the amount of annual loss in the Brahmaputra basin due to flood and drainage congestion is enormous."72

There were also reports of the interest shown by the U.S. government and various organisations of that country to study and recommend 'solutions' for the development of 'water resources' in South Asia. It was noted that in the decade preceding 1978 Harvard University's Centre for Population Studies had been investigating the Ganga and Brahmaputra Rivers with the aid of funds provided by the World Bank and the Ford Foundation, and in their research paper presented an "idea for a revolutionary technical fix that might provide water for

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70 ibid.
71 ibid.
72 ibid.
all in all, the portents of the Ganga and Brahmaputra are not good, but is there and alternative? The answer to the question is: probably control of the Brahmaputra and the Ganga is not simply a technical problem. Nor is it a problem that can be solved by engineers from America and Britain (though they could help). The use and control of the rivers is intimately related to the agrarian relations of the area and the historical development of the area. And alternative plan would need basin-wide co-ordination and technical support, but more than that it would need popular support and understanding. Millions of small projects carried out primarily by manual labour could, as various Chinese examples have shown, mitigate floods, conserve soil, conserve water for year-round use and divert it for irrigation. But the minimum pre-condition for the project would be genuine land reform. 

The following diagram based on the data provided by Hofer and Messerli visually represents the occurrence of floods in the Brahmaputra Valley in Asom in the four decades between 1954 and 1994, and the area inundated by these floods. As it demonstrates, floods of the Brahmaputra and its tributaries have annually inundated thousands of square kilometers of area every year, but only occasionally did its impact more than a third of Asom’s geographical area, or 25,000 square kilometers. Within this period, only in 1988-89 did the floods affect close to half of Asom, in which a series of floods in close succession resulted in exceptionally high rates of damage.

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74 ibid., p.130.
The Taming of the Brahmaputra

It was this path the central government was to follow, implemented through the Brahmaputra Board in the coming decades. The terms of reference for the Brahmaputra Board included the preparation of

a Master Plan for the control of floods and bank erosion and improvement of drainage in the Brahmaputra and Barak valleys. In preparing the Master Plan the Board was required to pay due attention to the harnessing of the water resources of these rivers for hydropower, irrigation, navigation, etc. Accordingly an integrated basin development approach has been adopted in preparing the Master Plan.76

Under the aegis of the Brahmaputra Board, the government discourse shifted to the “control, regulation and development” of the Brahmaputra Valley through

the direct involvement of the central government. The Board itself became functional from December 1981, with the mandate and "responsibility of preparing a Master Plan for the control of floods and bank erosion and improvement of drainage in the Brahmaputra and Barak valleys." For this, the Board would prepare Master Plan for the "development and utilization of the water resources of the Brahmaputra and Barak for irrigation, hydro-power, navigation and other beneficial purposes." The Board was entrusted with the task of making detailed project reports and estimates for dams and other works under the Master Plan as well as "to construct, maintain, and operate such of them as may be approved by the central government." The construction of large storage reservoirs on some of the major tributaries of the Brahmaputra was considered as "the key to the solution of the problems of the Brahmaputra". As such, projects of multipurpose dams were made "integral part of the Master Plan".

For almost five years after its constitution, the Brahmaputra Board collected scientific data by itself and also analysed those which were collected by various institutions and government departments. In order to formulate the Master Plan and to "secure comprehensive data for the future", it conducted investigations, field surveys, and observations where it was felt that there was inadequate information. As the preparation of a comprehensive work plan for a massive river system like that of the Brahmaputra was considered to be a monumental task, the Plan had to be carried out in parts. Accordingly, "The first priority has been accorded to the main stem of the river. Individual plans are to be prepared for each tributary or group of tributaries." In this exercise, a number of specialist organisations such as the CWC, Central Electricity Authority, Geological Survey of India, Indian Meteorological Department, Survey of India, Central Water and Power Research Station, Central Soil and Minerals Research Station, College of Earthquake Engineering, Remote Sensing Agency, and even the Indian Institute

\[^{77}\text{ibid.}\]
Mega Dams in Ganga-Brahmaputra-Meghna Basin

of Management, Bangalore were mobilised. The Plan for the "main stem" of the river system, i.e., the Brahmaputra was completed in 1986, while the project reports for two major multipurpose dams: the Dihang Dam Project and the Subansiri Dam Project were completed by the Board, investigations of which were in progress for the past several years, were submitted to the GOI.\textsuperscript{78}

In spite of the admission that there was a lack of adequate scientific knowledge to decide on the feasibility and desirability of multipurpose dams in the region, which the way forward was nevertheless considered to be their construction for the long term solution of the 'problem', while substantial success was claimed of the works of flood protection and anti-erosion measures carried out till 1980s. As the Master Plan prepared in 1986 by the Board claimed,

The difficult terrain of the Brahmaputra basin and insufficient hydrological, hydrometeorological and geological data made investigations of multipurpose reservoirs both difficult and time consuming. Nevertheless it cannot be denied that the flood control measures implemented so far have afforded reasonable protection to an area of 13.27 lakh hectares out of a total flood prone area of 19 lakh hectares. But for the protection works, which was taken up in 1954, Dibrugarh town would have ceased to exist... It may be concluded that considerable progress has been made during the last thirty years in the implementation of flood control measures, keeping in view the recommendation of the various committees and experts.\textsuperscript{79}

During this period, the rivers were increasingly demonized in the official rhetoric put forward by the state in an attempt to establish the building of big dams as the only solution to the 'problem rivers' of the region, accompanied by promises of development and prosperity for the people. The following table shows the rivers identified for 'development' in the 'North East' through building of dams, their estimated storage and installed capacity for hydropower generation.

\textsuperscript{78} ibid., pp. 47-49
\textsuperscript{79} ibid., p.60.
Storage and installed capacity for proposed Reservoirs in the Brahmaputra and Barak Basins

<table>
<thead>
<tr>
<th>Basin/sub-basin</th>
<th>Live-storage (bcm)</th>
<th>Installed capacity (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>By 2010</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subansiri at Gerukamukh</td>
<td>0.64</td>
<td>600</td>
</tr>
<tr>
<td>Tipaimukh</td>
<td>9.00</td>
<td>1,500</td>
</tr>
<tr>
<td>Bairabi</td>
<td>1.78</td>
<td>75</td>
</tr>
<tr>
<td>Jadukata</td>
<td>0.72</td>
<td>450</td>
</tr>
<tr>
<td>Siang (lower)</td>
<td>0.80</td>
<td>2,000</td>
</tr>
<tr>
<td>Noa-Dihing</td>
<td>0.13</td>
<td>75</td>
</tr>
<tr>
<td>Kulsi</td>
<td>0.69</td>
<td>36</td>
</tr>
<tr>
<td>Someswari</td>
<td>0.09</td>
<td>130</td>
</tr>
<tr>
<td>Um-N-got</td>
<td>0.03</td>
<td>710</td>
</tr>
<tr>
<td>Total</td>
<td>13.88</td>
<td>5,579</td>
</tr>
<tr>
<td><strong>By 2020</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subansiri</td>
<td>6.02</td>
<td>6,700</td>
</tr>
<tr>
<td>(upstream reservoirs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lohit</td>
<td>2.75</td>
<td>3,000</td>
</tr>
<tr>
<td>Kameng</td>
<td>1.07</td>
<td>1,100</td>
</tr>
<tr>
<td>Kulsi</td>
<td>0.69</td>
<td>36</td>
</tr>
<tr>
<td>Total</td>
<td>10.53</td>
<td>10,800</td>
</tr>
<tr>
<td><strong>By 2030</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Siang (Yingkiong)</td>
<td>5.30</td>
<td>10,700</td>
</tr>
<tr>
<td>Siyom (Kaying)</td>
<td>0.50</td>
<td>700</td>
</tr>
<tr>
<td>Debang</td>
<td>2.00</td>
<td>1,000</td>
</tr>
<tr>
<td>Total</td>
<td>7.80</td>
<td>12,400</td>
</tr>
</tbody>
</table>

The question over building of dams have also created contradictions between the rulers in Delhi and their surrogates in the region, for example in Arunachal Pradesh, as well as between the regional ruling props in Arunachal Pradesh and Asom. The object of such contradictions were of course no the interest of the people who were going to be affected by the state policies and projects, but over the sharing of the windfall gains accruing from the construction of these dams. The regional ruling elite in Arunachal Pradesh frustrated the central

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government's efforts to go ahead with the dams for a few years in late claiming that the province was denied its due share of the revenue. This internal contradiction in the late 1990s and early 2000s however have given way to a subsequent understanding between both sections of the ruling class, with the result that not only the outstanding projects were cleared for implementations, but agreements for a great number of new projects were also entered into by the regional ruling class with state-run and private corporations. In the period between 2006 and 2009 the Arunachal Pradesh government signed 103 Memoranda of Understanding with government as well as private organisations for projects related to "water resource development".81

The most powerful resistance to the building of mega dams, however, has come in the last decade from the people of the region, and is today growing in strength as more and more are becoming conscious of the dire consequences of these structures for their life, livelihood and existence. The claims of the state that the dams could provide lasting solution to the problems of the region have been questioned and challenged, as is their reasonableness and viability from a scientific and technological point of view. It has been argued that the knowledge of the river system and its connection to the ecology of the region is not adequate, so much so that there is hardly any means of predicting the long term natural effects of this endeavour.