25 Dams and Environmental Governance in North-east India*

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Introduction

The North-east[1] has been identified as India's 'future powerhouse'[2] and at least 168 large hydroelectric projects with a total installed capacity of 63,328 MW (Central Electricity Authority 2001) are proposed for the region.

States such as Arunachal Pradesh and Sikkim are at the forefront in the initiative to sign multiple memoranda of understanding/agreement (MoU/MoA) with power developers. Till October 2010, the Government of Arunachal Pradesh had allotted 132 projects to companies in the private and public sectors for a total installed capacity of 40,140.5 MW. The large dams' juggernaut clearly promises to be the biggest 'development' intervention in this ecologically and geologically fragile, seismically active, and culturally sensitive region in the coming days. Currently 10 large projects are already operational in the region, 11 are under construction, and a substantially larger number are in the process of getting various clearances. The government and the proponents of large dams in the region paint a win-win picture: exploiting the country's largest perennial water system to produce plentiful power for the nation; economic benefits for northeastern state governments through export of power to other parts of the country, and comparatively little direct displacement of local communities as compared to elsewhere in the country.

Despite this seemingly optimistic picture, ground realities within the region have led to dams becoming a major issue of conflict in the region in recent years. The upstream, downstream, and cumulative ecological and social impact of dams in the Brahmaputra and Barak river systems has been a major issue of debate and concern, including being the subject of intense debates in state legislative assemblies and in the Parliament. This chapter highlights some of the key issues which have emerged in the ongoing debate in the region which need to be urgently addressed while evaluating the viability of a hydropower programme as envisaged in the current form. These issues are across

* This chapter is an adapted version of a briefing paper by Vagholikar, Niraj and P.J. Das (2010), 'Damming Northeast India', Kalpavriksh, Aaranyak, and Action Aid India. It primarily relies on the section of this paper which was authored by this contributor. The existing piece also refers to existing writing/publications by Kalpavriksh members on the issue in the last ten years which may not necessarily be specifically referenced. These include the special issue of the 'Ecologist Asia' magazine on Northeast dams brought out in January 2003 (guest edited by Kalpavriksh members Manju Menon, Kanchi Kohli, and Neeraj Vagholikar); the 'Dossier on Large Dams for Hydropower in Northeast India' by Manju Menon and Kanchi Kohli, published by South Asia Network on Dams, Rivers & People (SANDRP) and Kalpavriksh in 2005 and; extensive writing in the popular media by Neeraj Vagholikar.

[1] North-east includes eight states—Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura.

[2] The tag of being the country's 'future powerhouse' has been proactively used for the region since the Northeast Business Summit in Mumbai in July 2002.

diverse categories of subjects (for example, governance, socio-cultural aspects, and environmental issues) with overlaps.

The overarching framework within which the issues highlighted in this chapter are examined is 'environmental governance'. This is because in the current governance framework in the country it is primarily within the environmental decision-making processes of the Central Government through its Ministry of Environment and Forests (MoEF) that environmental and social impacts are supposed to be addressed in a substantive manner.[3] Large hydroelectric projects need to pass through mandatory 'environmental clearance' procedures, administered by the MoEF, to evaluate their viability on environmental and social grounds. Such a process also involves mandatory public consultations before projects are appraised for grant or rejection of clearance. Based on their specific locations projects could also require other clearances, such as a 'forest clearance' from MoEF and approval from the Standing Committee of the National Board for Wildlife (NBWL) where locations inside or within a 10 km radius of wildlife protected areas (PAs) are involved.

Environmental Impact Assessment (EIA): A Critique

Northeast India, consisting of the eight states of Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Tripura, and Sikkim, is known for its biological and cultural diversity and the unique Brahmaputra and Barak river systems. The region is rich in biodiversity and is home to important populations of wildlife species, such as the rhino, elephant, tiger, wild water buffalo, pigmy hog, and the Gangetic river dolphin. Three out of 34 global biodiversity hotspots cover parts of India: Himalaya, Indo-Burma, and Western Ghats, and Sri Lanka (www.biodiversityhotspots.org). Two out of these three, Himalaya and Indo-Burma, cover extensive portions of the Northeast. In just 8 per cent of the country's geographical area the region also house 21 per cent of the important bird areas identified as per international criteria by the Bombay Natural History Society and Birdlife International.

The Brahmaputra is one of the world's largest rivers, with a drainage basin of 580,000 sq km, 33 per cent of which is in India (Goswami and Das 2003). Originating in the great glacier mass of Chema-Yung-Dung in the Kailas range of southern Tibet at an elevation of 5,300 metres, it traverses 1,625 km through Chinese territory and 918 km in India, before a final stretch of 337 km through Bangladesh, emptying into the Bay of Bengal through a joint channel with the Ganga. A unique river, it drains such diverse environments as the cold dry plateau of Tibet, the rain-drenched Himalayan slopes, the landlocked alluvial plains of Assam, and the vast deltaic lowlands of Bangladesh. An extremely dominant monsoon interacting with a unique physiographic setting, a fragile geological base, and an active seismotectonic instability together with anthropogenic factors have moulded the Brahmaputra into one of the world's most intriguing and gigantic river systems. The river carries the second largest sediment yield in the world, while it ranks fourth in terms of water discharge. The river system is intricately linked with the floodplain ecology of wetlands (*beels*) and grasslands in the Brahmaputra valley. For example, these linkages are evident in world-renowned eco-systems, such as the Kaziranga National Park in Assam. Due to the colliding Eurasian (Chinese) and Indian tectonic plates, the Brahmaputra valley and its adjoining hill ranges are seismically very unstable and the region has seen some major earthquakes.

The other major river basin in Northeast India is the Barak. This river has its source in Manipur and the upper Barak catchment area extends over almost the entire north, northwestern, western, and southwestern portion of the state. The middle course of the river lies in the plains of Cachar in southern Assam, while the lower, deltaic course is in Bangladesh. Both the Brahmaputra and the Barak river systems are also a lifeline for livelihoods, such as fishing and agriculture by local communities in their respective floodplains.

The region is home to a rich diversity of indigenous communities, with a substantial portion of the population dependent on natural resource-based livelihoods. This diversity of communities comes with unique socio-cultural, agro-ecological, and landholding systems (such as different forms of community control over forests in various parts of the region). Considering the unique features of the region and the scale of intervention planned, it is critical that the social and environ-

[3] Issues related to land acquisition have not been specifically addressed in detail in this chapter.

mental impacts are carefully assessed before deciding on the feasibility of large dams. A key feature of the current environmental clearance process is the Environmental Impact Assessment report, which is a critical document aiding decision-making. It is important to emphasize that this is the only study under current Central Government clearance mechanisms to have a mandatory component on socio-cultural impact assessment.

A common feature in all documents evaluating the development of hydropower projects in the North-east is the delays being caused by environment and forest clearances and how to address these. While there would certainly be certain aspects of the process which need to be streamlined, what is forgotten is the shoddy quality of EIA reports based on which virtually all projects continue to get clearances. Let us, for example, look at certain bio-diversity aspects of the EIA reports. Dr Anwaruddin Choudhury, renowned wildlife expert from Northeast India, has examined EIA reports of at least five large hydroelectric projects: the 600 MW Kameng, 2,000 MW Lower Subansiri, 1,000 MW Middle Siang, 1,500 MW Tipaimukh, and 3,000 MW Dibang and finds them all exceptionally poor on wildlife aspects. A common feature of his introductory comments on these reports is: 'contains innumerable (instances of) incorrect data, unverified and superfluous statements, and above all reveals the casual approach', referring to the power companies and EIA consultants. Dr Choudhury also says: 'It is shocking that mega hydel projects in the north-east are being granted clearances based on such reports. How can we decide the fate of some of the country's most important wildlife habitats based on sub-standard impact assessment studies?'[4]

Here are a few examples from these reports: the EIA for the 1,000 MW Siyom project lists 5 bird species in an area which has over 300 and even in this short list has one which is non-existent; the EIA for the 600 MW Kameng project reclassifies carnivores, such as the red panda, pangolins, and porcupines as herbivores and; the EIA for the 2,000 MW Lower Subansiri lists 55 species of fish in a river which has at least 156 and reports an area called the 'Arctic' in the Eastern Himalayas. All three projects have got a green signal based on these EIA reports. While bio-diversity was used as an indicator in these examples, the reports have been found to be poor in many social and environmental aspects as highlighted in subsequent sections of this chapter. In some cases the MoEF asked for additional detailed studies when EIAs were found to be poor, but often they have been post-clearance studies! There is little logic in first clearing the way for destruction of wildlife habitats and then doing a detailed assessment as a formality after project work and environmental destruction is well under way.

The main problem in current environmental decision-making processes is that virtually every project is treated as a fait accompli both by the expert committees appraising these projects and the regulatory authorities concerned. This subverts the possibility of a proper environmental decision-making process. Dr Dulal Goswami, environment scientist and renowned expert on the Brahmaputra river basin says: 'The geophysical nature of the Brahmaputra river basin is fragile and dynamic. The scientific knowledge base on the river system is currently very poor, for example on aspects such as sedimentation and hydrology which are linked to the economic life of the project. This needs to be strengthened urgently, more so in light of emerging threats from climate change. Without the availability of comprehensive information, how can we determine the long-term viability of projects in this region? The wisdom of such public policy has to be questioned. Economic viability apart, the mega-projects planned come with tremendous ecological and social costs which are unacceptable.'[5]

While a comprehensive analysis of the overall EIA framework[6] is beyond the scope of this chapter, some

[4] *Source*: Interview conducted by author with Dr Anwaruddin Choudhury on 12 January 2009. Review of unpublished comments of Dr Anwaruddin Choudhury on the EIA reports of the following hydropower projects: 600 MW Kameng (2002), 2,000 MW Lower Subansiri (2002), 1,000 MW Middle Siang (2003), 1,500 MW Tipaimukh (2007), and 3,000 MW Dibang (2007).

[5] *Source*: Interview conducted by author with Dr Dulal Goswami on 15 July 2010.

[6] For a more comprehensive analysis of environmental governance issues as a whole see the December 2006 report of the Planning Commission Task Force on *Governance, Transparency, Participation and Environment Impact Assessment in the Environment and Forest Sector for the XI Five Year Plan*. Although several institutional changes in the environmental governance framework have taken place or are underway since then, the overall issues in environmental governance broadly remain the same.

principles which need to be in place for comprehensive, credible environmental governance on Northeast dams are: commissioning of EIAs to be done by an independent body/regulator and not the project developer as is the current practice; need for public consultation in the Northeast at the 'scoping' stage when terms of reference (ToR) for EIA studies are determined; EIAs to be carried involving both local experts and communities (not only by outside consultants); final EIA reports to be open for peer review and public scrutiny for at least two months before a project is appraised for environmental clearance; no clearances should be granted based on poor, sub-standard EIAs, fresh studies should be insisted upon before a decision is taken; involvement of local communities in monitoring commissioned projects; post-facto impact assessment of already commissioned projects to assess actual impacts and gain insights for future planning and; clearly defined legal norms to weed out 'conflict-of-interest' in relevant expert appraisal committees deciding on environmental clearances and greater involvement of people from social sciences in such decision-making.

It needs to be mentioned here that a former chairperson of the expert appraisal committee (EAC) on river valley and hydroelectric projects, which evaluates projects for environmental clearance, resigned after public pressure on the MoEF in 2009. He was a director on several power companies and also presided over the environmental clearances of projects which were promoted by companies on whose board he served (for example, the 1750 MW Lower Demwe in Arunachal Pradesh co-promoted by PTC India Ltd.). But the main issue here is not about a particular individual or company concerned, but about MoEF's faulty policies for constitution of EACs; currently also the subject of a public interest litigation in the Delhi High Court.[7] While MoEF claims that some of the problems in the current framework will be addressed by the setting up of the proposed National Environmental Appraisal and Monitoring Authority (NEAMA), critics have argued that unless the Government of India agrees to give social and environmental issues the same importance as techno-economic issues keeping in mind the long-term ecological security of the country, new authorities will not address the issue. For example, despite the perception in some sections of media and industry that MoEF is blocking environmental clearances, Right to Information (RTI) data clearly show that a very high percentage of all projects which apply for environmental clearances are granted these. For instance, the rate of environmental clearances in the period 1August 2009 to 31 July 2010 was over 90 per cent (ercindia.org).

Underestimating Social Impacts

One of the major arguments put forward to argue for large hydroelectric projects in the North-east, is that there is relatively 'small displacement' by submergence as compared to that in other parts of the country and therefore these projects are benign. But a careful perusal of the ground situation indicates that displacement, particularly of livelihoods and rights, is grossly underestimated. Azing Pertin of the Siang Peoples Forum in Arunachal Pradesh says: 'Since our state is hilly, there is very little land where permanent cultivation is possible. Virtually all our available arable lands will be submerged by the 2700 MW Lower Siang project in the affected area in the Siang Valley. The magnitude of impact has to be understood keeping this context in mind. It is misleading to argue that the land being lost is a small percentage of the total area of the district or state and wrongly assume that the project is benign.'[8]

The impact of dams on resources under common use (for example, pasture land), vital to the livelihoods of local communities, is also a major missing link in the impact assessment of projects.[9] In addition to submergence, land use restrictions for local communities will apply in the catchment area of the reservoir as per mandatory norms to reduce siltation and to increase the life of the reservoir. Further, compensatory mechanisms required as per forest laws to offset the loss of forests due to a project, also lead to protection of other areas, affecting

[7] *Kalpavriksh & Others* v. *Union of India*, Writ Petition (Civil) No. 2667 of 2011 in High Court of Delhi.

[8] Interview conducted by author with Azing Pertin on 26 August 2010

[9] Personal communication with Dr Gita Bharali, North Eastern Social Science Research Centre (NESRC), who has studied the impact of the Pagladiya and Karbi-Langpi projects in Assam. For detailed information and statistics on displacement due to development projects and activities in North-east India, please contact Dr Bharali at gitabharali09@gmail.com.

community access to land and resources. For example, a considerable part of the forests in Arunachal Pradesh are classified as 'Unclassified State Forests (USFs)' which are de facto under community control. Bringing such areas under 'Compensatory Afforestation' will necessarily involve declaring them as Protected or Reserved Forests, with greater state control . The impact on the rights of local communities in such cases also needs to be examined in terms of the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006.[10] Clearly the impact on local communities is well beyond just the submergence area. However, in the existing planning and decision-making process social and environmental impacts over the larger landscape due to various aspects described earlier, are not assessed. This is therefore not reflected in the decision-making on the overall viability of the project.

States, such as Arunachal Pradesh are home to small populations of culturally sensitive indigenous communities. Therefore, direct and indirect displacement is high if looked at in the perspective of the local population (as opposed to the population of the country). Dr Mite Lingi, Chairman of the Idu Indigenous Peoples Forum, says: 'The "small displacement" argument to sell these projects as being benign needs to be confronted. The entire population of the Idu Mishmi tribe is around 9500 and at least 17 large hydel projects have been planned in our home, the Dibang Valley in Arunachal. As per this faulty argument, little social impact will be indicated even if our entire population were supposedly displaced!'[11] The land in the state has also been customarily delineated between different indigenous communities and clans. Therefore, contrary to popular belief, there isn't plenty of land for resettling people in the state, just because the population density is less.

Further, concerns being expressed in states like Arunachal Pradesh and Sikkim are not restricted to the issue of displacement. The over-900-day *satyagraha* in Sikkim by affected indigenous communities from 2007–9 focused on the impacts of hydel projects on Dzongu, the holy land and reserve of the Lepcha tribe. The protests have also received the support of the Buddhist monk community in Sikkim, as a sacred landscape stands to be desecrated. Sociologist Vibha Arora says: 'Such protests are not merely on grounds of displacement but that the region's cultural and ethnic traditions are rooted in the river Teesta and its environs.' A major concern in the North-east is the influx of large labour populations from outside the region in areas inhabited by vulnerable indigenous communities. Dr Lingi adds, 'We have been given constitutional and legal protection, particularly with respect to our land rights and restricted entry of outsiders. These projects are going to require both skilled and unskilled labour which Arunachal Pradesh cannot provide. 17 large projects in the Dibang Valley will bring in outside labour, upwards of 150,000 people, for long periods, as these are long gestation projects. We are concerned about the demographic changes and other socio-cultural impacts associated with this, as the Idu Mishmis are only 9500 in number. The development policies are in glaring contradiction to the constitutional and legal protection we have been given.'[12]

While some states, such as Arunachal Pradesh have attempted to address some of the issues through state-specific resettlement and rehabilitation (R&R) laws,[13] these primarily restrict themselves to increasing compensations for individual and community land (including forest land) to be directly acquired for the project. But prior to addressing R&R, a robust social impact assessment would need to factor in the socio-cultural realities of the region as pointed out earlier, including identification of project-affected persons (PAPs) whose land may not be directly acquired but are clearly affected by the project.

We All Live Downstream

An issue of heated current debate in the North-east is the downstream impact of dams, often a lacuna in the broader popular discourse on the impact of dams in

[10] For more information on this law and its implications for infrastructure projects in forest areas see the report *Manthan* of the joint MoEF-MoTA committee looking at the implementation of the law, available at: envfor.nic.in & fracommittee.icfre.org.

[11] Interview conducted by author with Dr Mite Lingi on 8 July 2009.

[12] Interview conducted by author with Dr Vibha Aurora on 5 September 2007. Interview conducted by author with Dr Mite Lingi on 8 July 2009.

[13] Arunachal Pradesh enacted its R&R law in 2008.

the country, which is primarily influenced by upstream submergence and displacement. When large dams block the flow of a river, they also trap sediments and nutrients vital for fertilizing downstream plains. They alter the natural flow regimes which drive the ecological processes in downstream areas. Quite literally they disrupt the connections between the upstream and the downstream, between a river and its floodplain.

A major catalyst in triggering the larger debate on downstream impacts of dams in Assam, has been repeated incidents of dam-induced floods across the state from upstream projects (for example, the 405 MW Ranganadi in Arunachal Pradesh) in recent years. Concerns about downstream impacts raised in the North-east include loss of fisheries; changes in *beel* (wetland) ecology in the floodplains; impacts on agriculture on the *chapories* (riverine islands and tracts); impacts on various other livelihoods due to blockage of rivers by dams (for example, driftwood collection, sand, and gravel mining); increased flood vulnerability due to massive boulder extraction from riverbeds for dam construction and sudden water releases from reservoirs in the monsoons and dam safety and associated risks in this geologically fragile and seismically active region. The Brahmaputra valley, a thickly populated narrow strip of land with hills surrounding it, has awoken to the fact that it is going to be increasingly vulnerable to risks from existing and proposed large dams upstream. This realization has been significant for a civilization whose cultural identity—customs, food habits, music, and religious beliefs—is inextricably linked to its river systems.[14]

One of the key issues which have come up is the drastic daily variation in river flows which will take place after these dams are commissioned, particularly in winter. For example, the average winter (lean season) flow in the Subansiri river in its natural state is approximately 400 cubic metres per second[15] (cumecs). Both the ecology of the downstream areas and people's use of the riverine tracts in winter is adapted to this 'lean' but relatively uniform flow of water on any particular day (even though there is a gradual variation through the season). *Chapories*, for example, which are exposed and drier in winter are used for both agriculture and cattle grazing purposes by local communities, and simultaneously by wildlife. After the commissioning of the 2,000 MW Lower Subansiri project, flows in the Subansiri river in winter will fluctuate drastically on a daily basis from 6 cumecs for around 20 hours (when water is being stored behind the dam) to 2,560 cumecs for around 4 hours when the water is released for power generation at the time of peak power demand in the evening hours. Thus, the river will be starved for 20 hours and then flooded for 4 hours with flows fluctuating between 2 and 600 per cent of normal flows on a daily basis.

The flow during peak load water releases in the Subansiri river in winter will be equivalent to average monsoon flow and will cause a 'winter flood', drowning on a daily basis drier riverine tracts used both by people and wildlife throughout winter. The downstream livelihoods and activities likely to be impacted by this unnatural flow fluctuation in the eastern Himalayan rivers include fishing, flood-recession agriculture (for example, mustard), river transportation, and livestock rearing in grasslands for dairy-based livelihoods. But downstream communities are yet to be officially acknowledged as project-affected persons due to upstream dams. Flow fluctuations in rivers, such as Lohit, Dibang, Siang, and Subansiri will seriously impact breeding grounds of critically endangered grassland birds, such as the Bengal Florican, foraging areas of the endangered wild water buffalo, habitat of the endangered Ganges river dolphin, and important national parks, such as Dibru-Saikhowa and Kaziranga. For example, the combined operation of the 1,750 MW Demwe Lower (Lohit), 3,000 MW Dibang, and 2,700 MW Lower Siang, all terminal dams on their respective rivers, will cause an unnatural, drastic fluctuation of over 4 metres (13 feet) in water levels on a daily basis in winter in the Dibru-Saikhowa National Park located in downstream Assam.[16]

[14] Note on 'Socio-economic Impacts of Big Dams in Downstream Areas of Assam' presented by Dr Chandan Kumar Sharma during the public consultation on dams in Northeast India held in Guwahati on 10 September 2010.

[15] One cubic metre = 1,000 litres. Therefore, a flow of one cumec (cubic metre per second) is equal to 1,000 litres/second.

[16] Downstream impact assessment for the 2,700 MW Lower Siang project carried out by the Water and Power Consultancy Services (WAPCOS). This interim report is available at: apspcb.org.in.

But until very recently, the ToRs for EIA studies granted by MoEF ignored an assessment of downstream impacts. This is, for example, evident from ToRs issued for at least 50 large hydroelectric projects in Arunachal Pradesh from September 2006 to August 2010. In most cases the 'baseline data' is restricted to only 10 km downstream of the project and the actual 'impact prediction' has been asked to be restricted to an even shorter distance downstream—only between the dam and the powerhouse! There is only one aspect which is mandatory to be studied beyond 10 km downstream in all cases; this is the 'dam-break analysis' which predicts the effects of flooding downstream in case the dam actually breaks. But, as indicated earlier, dam-break is not the only downstream risk a dam poses. Unfortunately, most detailed downstream studies are only prescribed as post-clearance studies as was done in the environmental clearance granted to the 15,00 MW Tipaimukh Multipurpose project in October 2008 and in the 1,750 MW Demwe Lower project on the Lohit river in February 2010. This clearly indicates that the projects are being treated as a fait accompli and the clearance processes as a formality. It was only recently that MoEF for the first time prescribed partial downstream impact studies for a few projects before grant of clearance (for example, the 3,000 MW Dibang Multipurpose project and the 2,700 Lower Siang). But the ToRs in these cases are very weak and will not give a comprehensive picture of the downstream impacts of these projects, a recipe for future conflicts. Moreover, the mandatory public hearings are being held only in the upstream state, even for projects which clearly acknowledge impact on flow patterns in downstream Assam.

It is absolutely important that comprehensive downstream impact assessment be made mandatory in all the ToRs for EIA studies for hydropower projects in the region (downstream distances for studies should be determined on a case-to-case basis according to the local context after widespread consultations); environmental risk-assessment as part of EIA studies should also be comprehensive, going beyond the current practice of restricting it to only a dam-break analysis; mandatory public consultations should be held in downstream affected-states and; based on this impact assessment and consultation processes, project-affected persons (PAPs) in the downstream should be identified too.

Run-of-the-river (RoR) Hydro

Irrespective of the impact of individual projects, an image has been projected in the policy domain that all RoR hydropower projects are 'environmentally and socially benign' and therefore win-win projects.

The Bureau of Indian Standards Code IS: 4410 defines a RoR power station as: 'A power station utilizing the run of the river flows for generation of power with sufficient pondage for supplying water for meeting diurnal (daily) or weekly fluctuations of demand. In such stations, the normal course of the river is not materially altered.'

IS: 4410 defines a storage dam as: 'This dam impounds water in periods of surplus supply for use in periods of deficient supply. These periods may be seasonal, annual or longer'.

Most of the so called 'run-of-the-river' hydroelectric projects being developed in the Himalayan region involve large dams which divert river waters through long tunnels, before the water is dropped back into the river at a downstream location after passing through a powerhouse. These projects are promoted as being 'environmentally benign' as they involve smaller submergences and lesser regulation of water as compared to conventional storage dams. This perception conveniently ignores the impact of several features intrinsic to this design. For example, long stretches of the river will be bypassed between the dam and powerhouse, with up to 85–90 per cent of the river flow in the winter (lean season) diverted through the tunnels. In the 510 MW Teesta V project in Sikkim the head race tunnel taking the water from the dam to the powerhouse is 18.5 km long and bypasses a 23 km length of the river. Not only will this destroy riverine ecology, but a cascade of projects will mean most of the river would essentially end up flowing through tunnels.

These projects also involve extensive tunneling in a geologically fragile landscape, the environmental and social impacts of which are grossly underestimated. Impacts observed include cracks in houses above long tunnel alignments, drying up of water resources, and major landslides. The list of PAPs is clearly much longer than what is calculated at the planning stage which only looks at those whose land is to be directly acquired for various project components. The tunneling also generates a huge quantity of muck and rock

debris, the disposal of which is a huge challenge. The indiscriminate dumping of such massive quantities of excavated muck in steep Himalayan valleys with little available flat land has been another cause of serious impacts and environmental violations in projects. This is a fact corroborated by the Comptroller and Auditor General (CAG) of India in a 2009 report on Sikkim (http://www.cag.gov.in/html/cag_reports/sikkim/rep_2009/civil_chap1.pdf).

Another type of RoR project being built is that which has a 'dam-toe' powerhouse located immediately downstream of the dam. Examples of such a project are the 2,700 MW Lower Siang, the 1,750 MW Demwe Lower (Lohit), and the 2,000 MW Lower Subansiri located in the Arunachal foothills just before these rivers enter the plains. However, the impact of these mega RoR projects is certainly not small. The reservoir of the 2,000 MW Lower Subansiri project will submerge a 47 km length of the Subansiri river while the 2,700 MW Lower Siang project will submerge a 77.5 km length of the Siang river (total 100 km length of various rivers to be submerged in this project). These projects will also cause drastic daily fluctuation in river flows downstream (see section 'We all live downstream') due to power generation patterns, particularly in winter. Dam proponents argue that these projects are benign since the total flow in the river downstream over any 10-day period in the year will be the same as in the pre-dam condition. But they fail to acknowledge that the massively altered daily flow patterns will have serious social and environmental impacts in the Brahmaputra floodplains.

A misleading campaign is being run by certain sections which claims that RoR projects being built in states, such as Arunachal Pradesh do not even include construction of dams! It needs to be clarified here that the bulk of the projects involve not just dams but large dams[17] as defined by India's Central Water Commission, the International Commission on Large Dams (ICOLD), and the World Commission on Dams. Irrespective of the nature of the project, dams fragment rivers, breaking the organic linkages between the upstream and downstream, between the river and its floodplain. While it is welcome that the EAC and MoEF have finally started discussing release of 'environmental flows' (eFlows)[18] in recent times while evaluating projects, it will be misleading to again regard this as a panacea to make every project 'benign'. Eflows could be a crucial environmental management measure in projects which are otherwise socially and environmentally acceptable, but it is a contested concept which needs more widespread debate in the local context.

It is therefore clearly misleading to universally label RoR projects as 'socially and environmentally benign' ones. Whether RoR or storage type, both the individual and cumulative impacts of hydropower projects in any river basin need to be comprehensively scrutinized and understood while granting permissions.

Cumulative Impacts of Dams, Carrying Capacity of River Basins

With multiple hydropower projects coming up in each basin, the issue of cumulative impacts of multiple dams and carrying capacity of river basins has become a crucial issue, whether it is the cumulative impacts of multiple RoR projects on the Teesta river in the uplands of Sikkim or the cumulative downstream impacts of over 100 dams proposed in Arunachal Pradesh on the Brahmaputra floodplains. Currently, environmental laws do not make it mandatory to have an advance cumulative impact assessment of projects in a river basin, but there are some interesting court orders. For example, the National Environmental Appellate Authority (NEAA),[19] a special environmental court in an April 2007 order observed that it feels the need for 'advance cumulative study of series of different dams coming on any river so as to assess the optimum

[17] ICOLD defines large dams as: 'those having a height of 15 meters from the foundation or, if the height is between 5 to 15 meters, having a reservoir capacity of more than 3 million cubic meters'. For further details see, http://www.icold-cigb.net/

[18] According to IUCN, Environmental Flows (eFlows) refer to water provided within a river, wetland, or coastal zone to maintain ecosystems and the benefits they provide to people. But there is no one accepted definition and the term is highly contested, meaning different things to different stakeholders (like 'sustainable development') (iucn.org). Several methodologies exist to determine eFlows. While evolution of such methodologies is important, it is crucial that eFlows cannot be restricted to a technical issue alone. Local negotiated solutions are required in each case.

[19] With the setting of the National Green Tribunal in October 2010, the NEAA has now been dissolved.

capacity of the water resource giving due consideration to the requirement of the Human beings Cattle, Ecology/Environment etc.' However, this order has been repeatedly violated by MoEF. Even though river basin-level studies have been prescribed for some river basins, such as the Teesta in Sikkim in the past and more recently for the Bichom, Lohit, Siang, and Subansiri in Arunachal Pradesh, these studies have been specifically delinked from clearances to be granted to individual projects and have not been done in 'advance'. Therefore, project clearances can continue business as usual in each river basin without the completion of cumulative studies, making it a cosmetic exercise. While MoEF's EAC in its September 2010 meeting finally expressed an opinion that a cumulative downstream impact assessment does indeed require to be carried out in Assam to study the impacts of multiple projects in the Brahmaputra river basin, it is silent on the need to halt environmental clearances of individual projects until such a study is completed.

The focus of a river basin level study can vary substantially according to how it is defined. While a 'cumulative impact assessment' will keep hydropower projects as the key focus, a broader 'carrying capacity study' or 'river basin planning' approach will look at the river basin as a whole with different competing land use/water use priorities and development options, of which hydropower projects is one.

It is important that river basin studies (including a cumulative impact assessment of multiple hydropower projects proposed in each basin) are carried out in advance; individual clearances cannot be delinked from such studies as is the current practice. The focus and ToRs of such studies should be determined after consultations in the concerned river basin. Such studies should be carried out independently (not by developers) and peer review and public consultations based on such studies should be carried out in each river basin. A primary objective of such an exercise should be to allow rivers to flow free so as not to disrupt natural ecology and riverine production systems (e.g. fisheries) on which local communities depend. Such rivers (or sections of rivers), identified and prioritised with the consent of local communities, should be 'no-go' areas for hydropower projects[20] i.e. areas where hydropower projects cannot be built.

Looking Ahead

While this chapter primarily focused on social and environmental issues viewed through the lens of environmental governance, there are clearly larger issues related to the political economy of development in general, and large infrastructure projects in particular, which need to be addressed to make a headway vis-à-vis emerging conflicts on hydropower projects in the Northeast.

For example, in May 2008 the then Union Minister of State for Power, Jairam Ramesh, raised concern about the 'MoU virus' which was affecting states like Arunachal Pradesh and Sikkim. He was referring to the very rapid pace at which agreements (MoUs/MoAs) were being signed by these state governments with hydropower companies, particularly in the private sector. Huge upfront premiums taken from developers, before mandatory public hearings had been conducted and environmental clearances obtained, rendered the environmental governance process meaningless. While there is clear opposition in Arunachal Pradesh to specific hydropower projects in certain river valleys, an important debate in the state is also on the manner in which a large number of projects are going to be simultaneously taken up and their cumulative impacts.

Therefore, from a policy perspective 'how can we rapidly harness the hydropower potential of the Northeast?' may be the wrong question to ask. Instead it might be more appropriate to ask: At what scale and in what manner can hydropower be produced in the region as a part of a larger development ethos which respects the ecological, social, and political context of the region? Both the central and state governments will need to go beyond existing technocratic institutions in the water and power sector to find the answer to this question and the people who actually inhabit these river valleys will need to be at the steering wheel of

[20] After a major public campaign GoI abandoned three hydropower projects on the Ganga and declared a 135 km stretch of it as ecologically sensitive under the Environment (Protection) Act, 1986. In Sikkim, an area of the Teesta river basin which was declared a 'no-go' area by MoEF in October 2008 after a detailed carrying capacity study of the river basin was re-opened for hydropower investigations in 2010.

the process to find the answer. For example, an issue which has come up for discussion in popular debate is the possibility of staggering or pacing the construction of projects, which are otherwise found to be socially and environmentally acceptable, in a river basin. This will also enable learning lessons from the experience of ongoing projects for future planning of hydropower in each river basin.

From a long-term perspective, technocratic institutions in the water and power sector (for example, the Central Water Commission and the Central Electricity Authority) need an urgent revamp to reflect diverse expertise beyond engineering and technocratic wisdom. In the current hierarchy of decision-making, environmental and social aspects of water (and the accompanying environmental governance framework) are both subservient and downstream of techno-economic issues. But reforms of technocratic water and power institutions are likely to be a long and arduous process. In the short-term there is no alternative to addressing these issues but through a strengthened institutional framework for environmental and social governance. Such an environmental governance framework will need to have a level-playing field with technocratic institutions which decide on techno-economic feasibility of projects, which would also mean a more upstream involvement in the planning of river basins.. While one suggestion by the government is having a multi-disciplinary Northeast Water Resources Authority (NEWRA), the idea needs debate in the region. Critics fear that it will be another technocratic institution merely pushing mega water infrastructure projects, rather than ensuring socially and ecologically sensitive planning of river basins.

Last but not the least, a more proactive engagement and scrutiny of financial institutions supporting water and hydropower infrastructure in the region on social and environmental issues is also much needed. The political economy of hydropower development in the region may not allow all the social and environmental issues to be fully addressed in the current environmental governance framework, hence relying on these 'clearances' as certificates of the viability of these projects may pose serious risks to investments in the long term, as is evident from major protests in the region against projects which have already got a green signal.[21] An underlying issue through all of this is that we will need to abandon a virtual dogma in current decision-making that each and every project is a fait accompli. Creating genuine space for addressing social and environmental issues, including the option of saying no to certain projects based on thorough scrutiny and public consultation, will be beneficial for all concerned in the long term.

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[21] A new issue which will be debated by financial institutions and other stakeholders in the coming days is the recently formalized Hydropower Sustainability Assessment Protocol (HSAP). The HSAP was created between 2007 and 2010 by the Hydropower Sustainability Assessment Forum (HSAF), an initiative of the International Hydropower Association (IHA), an industry group that was formed in 1995. The formalized HSAP and the details of the HSAF process are available at www.hydrosustainability.org. Many believe the HSAP will undermine the recommendations of the World Commission of Dams (WCD), the first independent review of the performance of dams completed in 2000. *Source*: www.internationalrivers.org.