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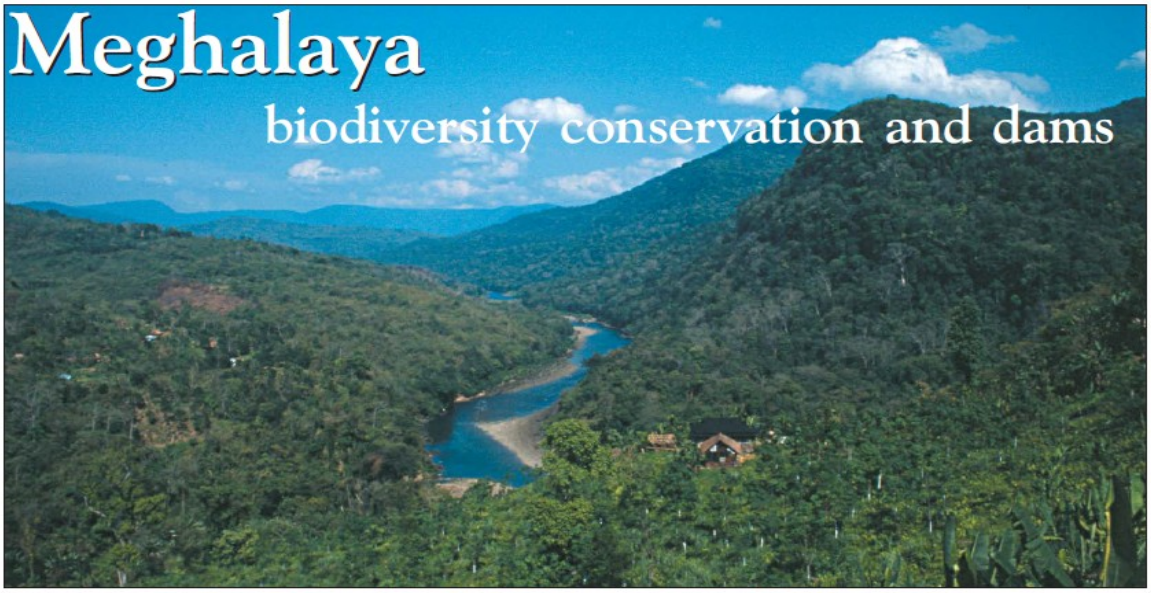
Large dams in Northeast India

rivers, forests, people and power

Meghalaya
biodiversity conservation and dams



GOUTAM NARAYAN

by B. Kharbuli, H. Kayang, D. Nengnong and D.R.M. Buam

Apart from the danger of a nuclear war, there is probably no greater environmental threat than the continued decay of the genetic viability and wealth of fauna and flora. Humans have altered the environment for millennia, causing some species to prosper and others to suffer. We are now changing the natural environment at a rate unprecedented in history and mass extinction is a certainty. Extinction and the loss of species in an ecosystem are irreparable and calamitous for all species, humans included. The greatest threats to biological diversity is ecosystem destruction, especially in the tropics, and the disappearance of habitats in the wake of developmental and industrial activities such as dam construction, mining, etc. A large number of species are also threatened by over-hunting, poaching and the illegal trade in bio-resources.

Dams and biodiversity

Construction of multipurpose dams for harnessing hydroelectricity, irrigation, flood control, etc. has been a part of the development process all over the world. These are generally located in thick forest areas with perennial river courses, rich in both terrestrial as well as aquatic biodiversity. Damming these watercourses inevitably leads to the submergence of forestland and consequently loss of habitat for various species and disruption in the breeding and reproduction of aquatic flora and fauna. It also impacts the socio-cultural and livelihood links which local tribal communities have with these ecosystems and the biodiversity therein. Hence it becomes necessary to very carefully evaluate the long-term viability of such projects in terms of its social and environmental costs and benefits.

Meghalaya has an assessed hydro potential of 2,394 MW, of which 185.2 MW has been developed.[1] The Umiam-Umtru basins have been developed over the past 45 years. This system has three concrete gravity dams, one weir, six earthen dykes, four reservoirs and a network of tunnels and open channels catering to five existing power stations.[2] Since the current generation is more than the peak demand in Meghalaya, the excess power is exported to neighbouring states.[3] But, in view of the proposed industrialisation of the state and the entire northeastern region, the Meghalaya government and the North Eastern Council has taken steps to develop thermal as well as hydro power generating stations in Meghalaya and the state is looking for investments in these sectors. One of the projects being taken up is the Myntdu-Leshka hydroelectric project stage – I (84 MW) in the Jaintia hills of Meghalaya. The Meghalaya State Electricity Board (MeSEB) has to a large extent, depended on the sale of peak power outside the state for its own financial viability, and the Myntdu-Leshka project will also involve evacuation of power from the state.[4]

In this piece we will take a look at the environmental characteristics of two dams in Meghalaya: the proposed Myntdu-Leshka and the existing Umiam-Khwan. On the one hand, biodiversity and livelihoods of local people dependent on these resources are being or have been sacrificed for these dams. On the other hand, some fundamental concerns that we have pointed out here pose a serious threat to the desired long-term objectives of these projects.

The Myntdu-Leshka dam

The proposed dam will be located 100 m. downstream of Leshka, the tri-junction of Umshaking, Myntdu and Lamu rivers, at a distance of 40 km. from Jowai, the headquarters of the Jaintia hills district. This is close to Pdengshakap village, located in the Amlarem block of the district. The area is situated on the south-facing slopes towards Bangladesh. The local population comprises mainly the Jaintia tribe (85-95%) with a population density of about 50-100/sq. km. The area is about 800-900 m. above msl. with an average slope of 10-15 degrees. The average annual rainfall is 6,000-6,345 mm. with a drainage density of 450-600 mm./sq. km. The area is classified as having moderate erosion (Anon, 2002). The power proposed to be generated from the 59 m. high dam is 84 MW (2x42). All the necessary 'No Objection Certificates' have been obtained and the process of land acquisition has already started.

Geologically, the area is part of the Cretaceous-Tertiary sedimentary sequence that

occupies the southern slopes of the Meghalaya plateau. The calcareous formations of the region belong to the Jaintia group of the Eocene period, which is equivalent to the Sylhet limestone formation of the Bengal basin. The Jaintia group has been further divided into three formations: the Langpar, Shella and Kopili formations, which together account for a total thickness of about 54 m.

However good the project's structural engineering may be, if the dam is built on limestone beds and the area is highly prone to seismic activity, then the question of the life-span of the dam is critical. There is likely to be slow seepage of water from the reservoir as the calcium carbonate, which is solid, tends to form soluble bicarbonates when it reacts with the region's acidic water, on account of upstream coal mining. The rock groups here are intricately juxtaposed. The rock types seen here are white sandstones, red-brown sandstones, quartzites and conglomerates. Good quality limestone deposits are also found in this area. A part of this is locally used by Mawmluh Cherra Cement, located at Mawmluh village, East Khasi hills, and Jaintia Cements, located at La Myrsiang village, Jaintia hills, while a large quantity is also exported to Bangladesh.

The soil in and around Pdengshakap varies in depth, thickness, texture, structure and colour, from light brown to deep brown and black soils. The light brown and deep brown soils are due to the presence of humus, which depends on luxuriant vegetation, which in turn depends on the climate. These soils are thick and at places, may be several feet deep. The products of weathering in this part remain in place due to the undulating nature of the landscape. But in the bottomlands and low valleys, the soils are black. In most cases, the soil is acidic (pH 4.5-5.3). This area falls in the moist sub-tropical zone, with moderate to heavy rainfall, averaging 6,000 to 6,345 mm. between May and September. The Mean Maximum Temperature recorded is 20 to 30°C, the mean minimum temperature is 15 to 22°C and relative humidity ranges from 45% in winter to 98% in summer.

Biodiversity

The area's natural vegetation is largely sub-tropical evergreen in nature. The common tree species are *Castanopsis indica, Rhus javanica, Dysoxylum gobara, Sapium baccatum, Spondias pinnata, Ficus racemosa, Terminalia bellerica, T. citrina, Elaeocarpus spp., Pterospermum spp., Syzygium spp., Ficus spp., Michelia champaca, Bombax spp., Cinnamomum spp.,* bamboos, canes, rattans, etc. Private

NEERAJ VAGHOLIKAR

High acidity levels caused by widespread 'rathole' coal mining upstream of the proposed dam site threaten the viability of the Myndtu-Leshka project.

plantations of *Areca catechu, Piper betel, Piper nigrum, Piper longum, Thysanolaena maxima*, etc. play a key role in the livelihoods of the local people. Rare species such as *Nepenthes khasiana* are also found here.

Land is owned either by communities or clans. There are also other privately-owned lands. The land-use pattern is largely non-agricultural, with sustainable agro-ecosystems consisting of plantations of oranges, arecanut, broomstick, *tezpata*, pepper, betel, vines, etc. from which local people derive their main livelihoods. There are still pristine forest patches rich in biodiversity in Amtapoh, Thlu-Umwi and Muktapur. Such patches of forest have been left untouched by the local people as part of traditional practices and rituals associated with sacred groves. However, the overall habitat in the region is fragmented and the disturbance index is medium to very high. In spite of this, the biological richness is medium to very high.

The project will totally require 181.16 ha. of land, of which 102 ha. is forestland. The endangered wildlife recorded in this area includes tiger, jungle cat and binturong, among other species. Shockingly, the report prepared by the Zoological Survey of India (ZSI) did not include any scientific names and even included 'rabbit' as one of the species found in the area, despite the fact that this species is not found anywhere in India! The ZSI report also says that fishing will help rehabilitate displaced populations, though there will be no displacement of people by the project, bringing into question the thoroughness with which the project has been studied and analysed for impacts.

Environmental clearance

The construction of the Myntdu-Leshka project is scheduled to start in 2003. While we cannot comment on how comprehensive the overall environmental impact assessment studies have been as we have not had an opportunity to critique these documents, the impending danger is that the dam will be built on a limestone foundation, threatening its long-term viability. Moreover, the area is also in a sensitive seismic belt.

The Ministry of Environment and Forests (MoEF) had initially sent back the proposal for environmental clearance of the project to the MeSEB, citing concerns about the very low pH value of the water, which indicates high acidity due to upstream coal mining and could be detrimental to the project. But the new data furnished by MeSEB subsequently, based on sampling by the Directorate of Mineral Resources at six places, seemed to indicate acceptable pH values. The Myntdu-Leshka project was granted environmental clearance by the MoEF on September 26, 2001.

Some of the terms and conditions under which clearance has been granted to the MeSEB indicate how serious a concern the upstream coal mining still is:

- Awareness should be created among the public as well as the miners through government agencies, NGOs and local bodies about the ill-effects of unscientific coal mining and haphazard dumping.
- Some of the tributaries carry water with a pH value that is as low as 3.1. The possibility of extracting sulphuric acid from such water may be explored. If found commercially viable, it would reduce the acidic inflow into the river besides providing employment opportunities. If acidic water is allowed to flow into the reservoir, the efficiency and life-span of the dam will suffer.
- It is proposed to treat the mine water and the Acid Mine Drainage with lime before releasing it into the streams. Since treating it with lime will not be able to remove the metal sulphides, an additional process has been proposed. This is to ensure that water from the tail-race which is used for irrigation of agricultural land is free of metals.

While the responsibility of implementation of environmental safeguards rests fully with the MeSEB and will be monitored by the MoEF, the proposed environmental management of upstream mining will be a mammoth task and cannot be achieved unless a clearly chalked out implementation mechanism for all the conditions is put into place and there is active coordination

between a number of agencies, including the miners. The experience of compliance of environmental norms around the country as well as the complex realities of the coal belt of the Jaintia hills, makes one that much more concerned about whether these conditions will actually get implemented by the MeSEB or remain a mere formality.

Umiam-Khwan dam

This dam is located between the East Khasi hills and the Ri Bhoi districts of Meghalaya, about 12 km. from Shillong. The reservoir (also known as Barapani), fed by the Umiam river, is used for hydro power, fisheries and to supply drinking water to the public and the Rangmen cantonment area. The dam has submerged a large cultivated area, mainly rice fields in the lowlands and on the hill slopes. The submergence of these areas has increased the pressures on the surrounding forests, leading to high disturbance levels. However, there are still a few forest patches rich in biodiversity, where sacred forests have been left untouched as part of local traditional practices and rituals. The area is situated on the north-facing slopes towards the Kamrup district of Assam. The population is largely tribal (85-90 %) with a population density of about 80-100/sq. km. The area is at an elevation of 500-800 msl. with an average slope of 20-25 degrees. The average annual rainfall is 2,600 to 3,500 mm. with a drainage density of 400 to 600 mm./sq. km. The area is classified as having moderate erosion. Water from the Umiam basin is diverted into the adjacent Umtru basin and used to generate power in several stages. Built during the early '60s, the power was supplied to neighbouring areas. However, while the scheme has been augmented to produce more power, the catchment has been allowed to degrade, threatening the life of the dam itself.

Geologically, the area is part of the sedimentary sequence that occupies the northern slopes of the Meghalaya plateau. Formations of the region belong to the Shillong group of the very old Miocene period. Thus the rock types seen here are Khasi sandstones, granites, white sandstones, red-brown sandstones, quartzites and conglomerates. Large quantities of granite, sandstone and sand are being extracted in this district for local consumption and for export to Bangladesh.

The soil in and around the dam varies in depth, thickness, colour, texture and structure. The area's light brown and deep brown soils are a result of the luxuriant vegetation and humus, which in turn, are an outcome of the climate.

This area falls in the sub-tropical zone, with moderate to heavy rainfall averaging 2,600-3,500 mm. between May and September. The mean maximum temperature is 20 to 30°C, mean minimum temperature is 15-22°C and the relative humidity ranges from 45% in winter to 98% in summer.

Biodiversity

The natural vegetation is largely sub-tropical evergreen. The common species of trees found in these areas are *Pinus kesiya, Schima wallichii, Castanopsis indica, Rhus javanica, Dysoxylum gobara, Camellia caduca, Syzigium tetragona, Castanopsis tribuloides, Docynia indica, Wightea gigantia, Quercus fenestrata, Quercus serrata, Wendlandia spp., Bucklandia populnea, Cordia myxa, Manglietia insignia, Quercus dealbata, Viburnum foetidum, Sapium baccatum, Spondias pinnata, Terminalia bellerica, T. citrina, Elaeocarpus spp., Pterospermum spp., Syzygium spp., Ficus spp., Michelia champaca, Bombax spp., Cinnamomum spp.*, bamboo breaks, etc. Private plantations are largely of broom grass *Thysanolaena maxima*, etc.

The land is owned either by communities or clans under the Mylliem or Khyrim Syiemships. There are also other privately-owned lands and the overall land-use pattern is agricultural. As pointed out earlier, the pressure on the surrounding forests has increased after communities lost lands due to submergence. Fragmentation and the disturbance index are very high and the biological richness is medium.

The small rivers of Umkhrah, Umshyrpi and Umjasai in Shillong and the Umdiengpun river at the base of the Eastern Air Command HQ feed the Umiam-Khwan dam. The first three rivers run through Shillong and are polluted by domestic sewage. At present, the main problems are extensive siltation and sewage pollution from the catchment area. These factors have contributed to the decrease in the population of the endemic chocolate mahseer *Neolissocheilus hexagonalepis*, and could seriously impact the long-term viability of this dam.

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The Garo, Khasi and Jaintia hills of Meghalaya are some of the northeast's richest biodiversity areas.

Lessons for the future

Upstream pollution and siltation is today threatening the utility of the Umiam-Khwan dam, and a similar situation could develop in the case of the proposed Myntdu-Leshka project due to upstream coal mining. It is essential that we consider the social and environmental costs carefully before investing scarce resources in additional projects that will further degrade Meghalaya's dwindling natural resource base. Past projects, such as Umiam-Khwan, that have entailed sacrifices on the part of both nature and local communities, need to be managed carefully so that they yield optimum benefits. The future development plans for the region should pay attention to biodiversity conservation. The land that binds the local communities together with the resources which form their livelihood base are not to be exploited for short-term benefits.

The case of Umiam-Khwan and Myntdu-Leshka dams – the manner in which the former has been managed and the latter has been planned, reflect that the state is going through rapid, though uneven, development and economic expansion. We need to ensure that natural resources are not eroded to accommodate development. Development is necessary for any society in transition, but not if the cost outweighs the benefits. ■

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2. Anon. (2002). *Biodiversity characterisation at landscape level in northeast India using satellite remote sensing and geographic information systems.* Indian Institute of Remote Sensing (NRSA), Department of Space, Government of India, Dehradun, Uttaranchal, India, pp. 92-103.
3. http://northeast.nic.in
4. http://databank.nedfi.com
5. Even though generation is more than 'peak demand' and electricity is evacuated outside the state, this does not indicate that the whole state is electrified. Rural electrification is not complete.
6. http://meseb.nic.in