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Mega Dams in the Himalayas: An Assessment of Environmental Degradation and Global Warming

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***Abstract--*Mega dams have the multipurpose applications and considered as the greener energy source than most alternatives. But as compensation to this development it may result a wide range of environmental degradation. This study aims to search the fact of environmental impacts due to the existing and proposed mega dams of the Himalayas and also to investigate the sustainability of the dams. Being the youngest and fastest changing mountain, the Himalayas and it mighty glaciers, sources of important rivers, are highly susceptible to global warming. Recently, there are plans to transform the Himalayan Rivers into the powerhouse of South Asia by building hundred of mega dams to generate 150,000-megawatt electricity in the next 20 years. These dams pose severe environmental risks in the Himalayan region and mostly in the downstream and the climate change associated with the global warming threatens the safety and viability of these hydropower projects. Dams and their associated reservoirs impact freshwater biodiversity and hydrogeology; changing turbidity, sediment levels, nutrient levels; causing flash flood and prolonged submergence; severe drought in dry season; affecting local ecology and habitat; contribute greenhouse gases and the resulting global warming; dry up the rivers for even longer lengths; impact traditional livelihoods, agriculture, irrigation and fisheries; threat political, regional and geo-strategic stability; increase the rate of disaster associated with the dam failure, land sliding, earthquake in the downstream. The study investigates the fact that the forthcoming hydrological projects in the Himalayas need proper EIA and information sharing to decrease the environmental impacts, to ensure water distribution of rivers, the riparian countries, to make the projects sustainable and to ensure benefits for all with proper negotiations and commitment.**

INTRODUCTION

Dams, once considered the blessing of mankind are now-a-days becoming the concern of environment. Dams, including large dams, are constructed because of the potential benefits that they bring; firstly, Water for increased food production, secondly, Generation of electric power without releasing atmospheric pollutants or greenhouse gases and for controlling floods and providing drinking water. About 60% of the world's river flow is regulated. There are more than 40,000 large dams and more than 100 dams with heights more than150 m. Reservoirs cover a total area in excess of 500,000 km^2.The Himalaya region of the world is one of the major dam oriented area is now undergoing rapid change from global warming. For example, glaciers in the Tibetan Plateau are melting at a "worrisome speed and over the past 40 years, Tibetan glaciers have receded 196 square KM, or 1/4 the size of New York City. Despite such loss of glaciers that feed important rivers in Asia; India, Pakistan, Nepal and Bhutan plan to build hundreds of mega-dams to power South Asia. But the consequences of these dams will bring severe damage to the low riparian country like Bangladesh having 57 trans-boundary rivers s**h**ares with her neighboring countries; 54 with India and 3 with Myanmar [4]. Each year about 2.4 billion tons of sediment from the Himalayas is carried by the rivers of Bangladesh to the Bay of Bengal and contributes significant role to the environmental management and socioeconomic sector of this country [9].

While a lot of voices are being generated over the issue of the Tipaimukh Dam in both Bangladesh and India, we are still oblivious as to what is happening all across the Himalayas, extending from the Pamir in Pakistan to the Arakan Yoma in Myanmar, in matter of management of water resources. This matter does not concern any single country but the whole of South Asian subcontinent, and the environment of the riparian countries is likely to be worst affected. This study brings forth some of the pertinent issues that we should give importance for the sake of environmental consideration as well as sustainable water management of the whole region. This study aims to search the fact of environmental impacts due to the existing and proposed mega dams of the Himalayas by analysis some case study. Figure 1, shows some proposed, under construction and existing major dams projects in the Himalayan region. The existing dams have already geared up the deterioration of the downstream envrionment like Bangaldesh and now the under construction and proposed dams will enhance the rate of threat in this area.

ENVIRONMENTAL CONSEQUENCES

The International Centre for Integrated Mountain Development, ICIMOD, in Nepal and the Intergovernmental Panel on Climate Change (IPCC) agree that global warming will also lead to more storms and floods, especially in tropical and mountainous regions. A report by ICIMOD on the impact of climate change on Himalayan glaciers states: "On the Indian subcontinent, temperatures are predicted to rise between 3.5 and 5.5°C by 2100. An even higher increase is predicted for the Tibetan Plateau. Climate change is not just about averages, it is also about extremes. The change in climate is likely to affect both minimum and maximum-recorded temperatures as well as triggering more extreme rainfall events and storms." These heavy storms and floods will jeopardize the economic profitability of hydropower projects, as well as the safety of these mountains of concrete. It may be mentioned in this connection that according to scientific estimates the large dams in India are responsible for about a fifth of the countries' total global warming impact. The estimates also reveal that Indian dams are the largest global warming contributors compared to all other nations. A study by Ivan Lima and colleagues from Brazil's National Institute for Space Research (INPE) estimates that emission of methane from all the reservoirs of the world could be 120 MT per annum. The study does not include the emission of nitrous oxide and carbon dioxide from large dams. If all these are included, the global warming impact of large reservoirs would go up further. The methane emission from India's dams is estimated at 27.86 % of the methane emission from all the large dams of the world, which is more than the share of any other country of the world. Brazil comes second with the emission of methane from Brazil's reservoirs being 18.13% of the global figure (Countercurrents.org). The consequent effect of dam is to increase the salinity in the downstream area like Bangladesh. During the post-Farakka period, salinity in the southwest region of Bangladesh increased significantly (Table 1). For example, at the Khulna station, the average monthly maximum salinity for April in the pre-Farakka period was 1626 µmho/cm. During 1976, when the Gorai discharge dropped to 0.5 m3/sec from its pre- Farakka average of 190 m3/sec, maximum salinity in April increased to 13,000 µmho/cm. Moreover, it may result a couple of socio-economic and environmental degradation in the floodplain area of downstream area like corrosion, water quality degradation, health hazard, agricultural production etc (Figure 2). Other than the salinity, water discharge rate in the downstream also reduced with alarming rate. Mean monthly discharge of the Ganges River at Hardinge Bridge in Bangladesh for the seven months of the dry season. Spectacular effects of diversion are noticed in the mean monthly discharges (Figure 3).

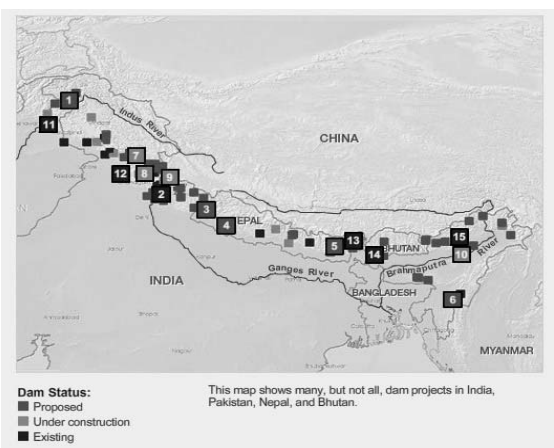

Figure 1: Mega dam projects in the Himalaya region [8].

Global warming might be the most serious challenge to the safety and efficiency of the proposed dams in the Himalayan region, but the funding gap appears to be hampering India and Pakistan moving ahead with the largest planned dams for the region, including the Diamer-Bhasha project. It also appears that strong local opposition to some of the major projects, including the West Seti project and the 3,000-MW Dibang project in Arunachal Pradesh, India, constitute larger obstacles for the project planners than anticipated. Planned public hearings for the Dibang project have had to be cancelled several times due to strong opposition. Perhaps most surprising, it is no longer clear that large hydro-dams are even a consistently climate-friendly source of energy. While hydro-electricity can be a substitute for carbon-dioxide producing fossil fuels, the reservoirs behind big dams often include large amounts of rotting vegetable matter and thus are a significant source of methane—a much more potent greenhouse gas. These methane emissions are larger in tropical and sub-tropical climates, where vegetation both grows and decays faster. A 2007 study suggested that methane from dam reservoirs actually accounted for 19 per cent of India's greenhouse-gas emissions, while hydro-power accounts for only 16 per cent of the country's electricity and less still of its total energy use. These figures are still preliminary estimates; methane emissions may be lower than average for dams high in the Himalayas, which is not an area where plant matter grows or decays rapidly; and there may be ways to mitigate these effects, by capturing and burning the methane to generate more power. But they call into question the common assumption that, despite the environmental risks, large dams are a 'greener' energy source than most alternatives; the non-trivial greenhouse emissions involved in creating huge amounts of concrete and steel further complicate the picture.

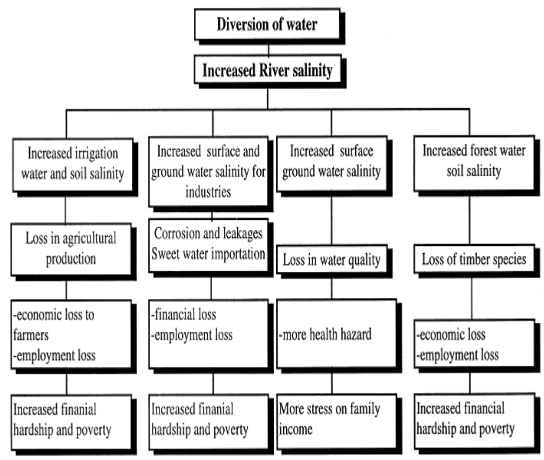

Figure 2: Increased river salinity and its possible effects [6].

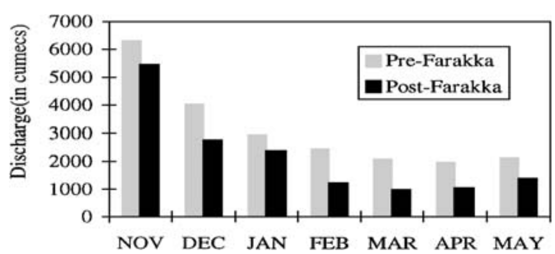

Figure 3: Dry season (November–May) mean monthly discharge of the Gorai River. Cumecs refers to 1 m3/sec flow of water [7].

FEASIBILITY OF THE DAM PROJECTS

The critical question, however, is that in a very high seismic sensitive region, is it safe to construct massive hydro-electric power projects? The recent international studies indicate that the construction of a mega dam and creation of a huge water body in severe seismic sensitive regions on the earth is not advisable, considering the complex geological aspects. For example, the 7.9 magnitude quake that had struck the entire Sichuan Province of China in May 2008, killing more than 80,000 people and leaving more than five million homeless, was due to the failure of the 511-ft 'Zipingpu Dam', which holds 315 million tonnes of water and lies near a geological fault-line and only three miles away from the earthquake's epicenter. The similar disaster cannot be ruled out in the event of constructing the Tipaimukh Dam on the Barak River – that runs along a similar geologic formation - in the southern most part of Assam in NE India.

TIPAIMUKHI DAM: A CASE STUDY

Another ominous factor for Bangladesh is the Tipaimukhi Dam which was initiated in 1948; a high capacity dam would be created in the Tipaimukhi Hydroelectric project of India having a height of 162.8 meter. The water containing power of this dam is 15.5 billion cubic meter and electricity produce capacity is 1,500 megawatt. 226 big dams would be created in their convenient places in south east of India to produce 99,000 megawatt electricity within the next 50years. It would be created align the border of Karimganj of Assam above the River Borak. This Borak River is the main stream of the Branch Rivers; Surma and Kushiara. Both these rivers conjointly created the big Meghna in Bangladesh. This river has a high speed stream and a high capacity to contain sand than the River Padma. India took a target to produce 50,000 megawatt of electricity by 2012.The Tipaimukhi High Dam is situated very adjacent to Bangladesh border. This project would result gathering massive collection and flow of sand under river, sudden flood, floods. All this reactions would be seen at the north-east region and especially at the Haor localization. Total scenario of this area would be changed drastically (figure 4). All the Haor, marshy lands, ponds rivers, embankments would be filled with sand of this region within 10-15 years. The fertile land of the Haor would turn into desert. Agriculture would be destroyed. Rice grains like Boro, Shail and Aman would lose its regional diversity. Biodiversity of this region would be lost. Plants, aquatic plants, traditional fish, and the infrastructure of this region would be in vain [5].

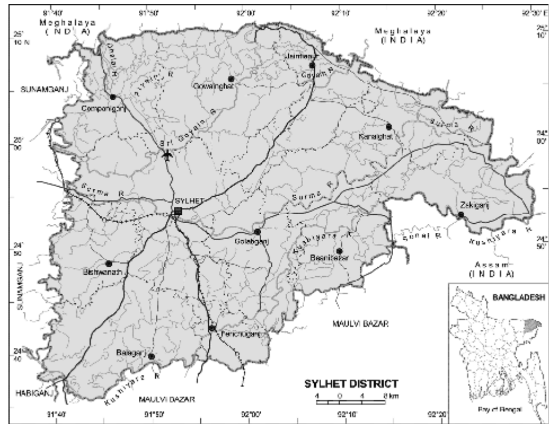

Figure 4: The map shows the part of Bangladesh that would get affected by the Tipaimukh Dam Project by India

The total ecosystem of this region would be jeopardized. If the rivers Surma and Kushiara die there would be no Meghna River in Bangladesh. Thus it is not only Sylhet and the Hawor localization that is in danger but also the localization around Meghna is in big risk. Economy of the country and the normal life of the people of Bangladesh would be paralyzed [9].

CONCLUSION

In the Himalayas the threat from the concrete works that would include huge walls damming the rivers, underground tunnels that could go scores of kilometer long, that could completely bypass and dry up the rivers for even longer lengths, the massive blasting that would be required for the same, the power houses, the roads, the townships, the mining that would be necessary to procure the materials for the projects, the hundreds of kilometer long transmission lines meant for the power promised to be generated, threats from all this is indeed of Himalayan proportions. And even if it cannot dwarf the mountain itself, certainly it has the potential to destroy large parts of it permanently.

Dams are a principal threat to environment mostly in freshwater diversity and that threat is largely mediated through loss of habitat frequently involving modifications to the natural flow regime and to blockage of migrations. Putting aside the enormous cost involved in constructing nearly 80 dams in the four countries stated above, it would not be wrong to question the wisdom of constructing them in fragile, erosion prone, landslides prone, active seismic zone.

In view of the above the prudent course would be for the Himalayan countries to develop water resources in a way that helps people of the region adapt to the changing climate as well as hydro-geologic characteristics and reduces their risks. The concerned countries of this region, therefore, should work together to forge a common platform for water resource management planning vis-à-vis river basin management that should be above opportunistic short term political interests but dedicated to a longer term regional socioeconomic development of the people with a common goal to safeguarding and ensuring a sustainable regional environment.

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Table 1. Pre- and post-Farakka average monthly maximum salinity at four stations in southwest Bangladesh. Salinity expressed in micro-mhos/cm (m-mhos/cm) and measured at 25°C.

	January		February		March		April		May	
Station	Pre-Farakka	Post-Farakka	Pre-Farakka	Post-Farakka	Pre-Farakka	Post-Farakka	Pre-Farakka	Post-Farakka	Pre-Farakka	Post-Farakka
Khulna	293	1,254	371	3,396	467	8,305	1,626	12,149	1,508	11,208
Goalpara Power Station	340	515	397	1,303	750	4,422	1,320	7,422	786	5,456
Chalna	2,600	6,280	2,625	11,510	8,950	17,310	8,675	21,927	12,000	19,009
Mongla	2,300	5,200	3,900	7,880	7,500	11,075	11,800	17,150	13,500	17,100

source: [8]