# Mega dams: focus on sustainability concerns

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The southern slopes of the Himalayas, the youngest mountain systems in the world, are so fragile and vulnerable to natural disasters. The recent events of floods, landslides and cloudbursts in the countries of India, Nepal and Pakistan have occurred in this belt. Each incident reminds the gaps in our early warning systems, disaster preparedness, urban planning and design of infrastructure, and last but not the least water resource management. Too many hydro power projects mushrooming in this region have set alarm in the minds of the people concerned.

Marked with its mighty rivers and the steep slopes, the Himalayas provide ample scope for hydro power projects. Considering the energy crisis faced by the South Asian countries, the hydro power potential of countries like Nepal, Bhutan and India need to be utilized fully. The major hindering factor is the massive investment required for big hydro projects to facilitate energy trade. But then the question is how much 'clean' is the energy produced from large hydro projects and whether it is sustainable in its very sense.

The weak rocks in the tectonically active Lesser Himalayan Region are easily vulnerable to seismic shocks, rains, frost action and to the imprudent activities of humans. The development of hydroelectric projects entails excavations for the head race dam, diversion tunnels, network of roads, residential colonies, etc., which is more likely to upset the natural balance in a zone of weakened rocks.

The threat to the rich and diverse biodiversity of the region is another disturbing concern. Large-scale excavations and deforestation associated with hydro projects result in the loss of biodiversity. Any obstruction to the natural flow of rivers causes changes in the nutrient and sedimentation flow affecting fish habitats. Most of the 100-odd hydro power projects, which are in the pipeline in the States of Uttarakhand and Arunachal Pradesh, are no exception and pose serious threat to biodiversity as well as the livelihoods of the local people.

Controversies regarding displacement, rehabilitation and compensation associated with hydro projects are often in the limelight. The number of people who are likely to be affected is estimated by taking into account those whose land will be submerged by the creation of a dam. But in the case of the Lower Subansiri project, a 2000-MW project in Assam, the Environment Impact Assessment stated that only 38 families in two villages would be affected. However, the livelihoods of the people in the valley are dependent on agriculture and allied activities during the lean season after the recession of flood water.

As pointed out a study done in 2011, this particular dam will have to store water for longer periods and then release it in order to generate peak load electricity, during the lean season. This cycle of diurnal storage and release of water will lead to 'winter floods' affecting the farming activities downstream. Owing to the demand of the environmentalists in other dam sites of India, now there is a regulation which ensures a minimum flow during the operational phase of the project so as to benefit the downstream dwellers. The Subansiri case provides a different dimension to this.

Frequent landslides and floods bring debris and sediment to the river valley and thus reduce the storage and carrying capacities of the water bodies. This has a negative impact on the economic life of the reservoirs. Considering the huge cost and time required and the environmental damage involved in the construction of large hydro projects, one should look at the most viable options to tap the hydro power resources with least possible environmental hazard.

Small run-of-the-river dams are proposed to be an alternative in the view of smaller environmental footprints, less investment, lesser time consumption, early benefits and the participation of local communities. The cost of electricity from small hydel projects would be higher but it is justified when one takes into consideration the monetary value of natural resources lost and the cost incurred in rehabilitation of human settlements involved in big projects.

The Union Ministry of New and Renewable Energy estimates the potential of small hydro power projects as 15000 MW of which hardly 20% (2939 MW) has been utilized till 2010. As per the World Small Hydro Power Development Report (2013), lack of availability of data with regard to discharge rate, geological aspects and sedimentation data, poor participation of local community, time involved in getting project clearance/permission/licenses, lack of manpower in planning and designing, and non-existence of legal tools to regulate water flow in the streams are the major barriers related to small hydel projects in India.

Ensuring credible environmental and social impact assessment at river basin/sub-basin level, reviewing dams under construction whether they have designs that can survive large earthquakes, proper planning at the river basin level taking into account the local ecosystems and the contribution to local people are inevitable for hydro projects. Geologically-sensitive high-risk zones must be declared as no project areas in each basin. Safer locations with comparatively less risk of earthquakes, deforestation and human settlement should be explored and utilized. The water flow in the Himalayan rivers during winter is lean and so options for multiple projects to harness wind energy should also be looked into.

The uncertainties of monsoon coupled with the vulnerability of the Himalayan ecosystem calls for strengthening early warning systems, disaster preparedness and protection of river beds/ floodplains through regulations. It also underlines the need for greater regional cooperation in weather forecasting, data sharing and multi-disciplinary research. For optimal use of hydro power potential of the region, proper risk and impact assessment must be undertaken with local participation.